The competitive advantage of the Portuguese maritime cluster: strong and rising?

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Author’s biography

Ana Rita Monteiro Neves was born on 14th February 1993 in Santa Maria da Feira.

In 2011 she initiated her academic path in University of Porto. In 2014, she received an undergraduate degree in Languages and International Relations from the Faculty of Arts. In the same year, she joined the Master in International Business of Faculty of Economics, in which this dissertation is written.

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Abstract

The concept of clusters and their influence on the competitiveness and development of regions and countries constitute important topics of research both among economists and non-economists. Since the introduction of the concept, several studies have been focusing on the merits of regional agglomeration, considering distinct economic activities and their impact on overall growth dynamics in production and employment.

Following this literature, in this work an attempt is made to study the Portuguese maritime cluster. An analysis is made of its recent evolution, assessing changes in competitive advantage based on the analysis of exports, unit values and market shares. It is our purpose to shed more light on the subject, which despite having received increasing attention from the political and media spheres, is still lacking a corresponding interest in the economic realm.

Our general findings indicate that in spite of being subject of a great political interest and provided of a natural competitive advantage, the Portuguese maritime sector is diminishing its importance both at domestic and international terms. In domestic terms, there has been a sustained decline in virtually all indicators analysed, and in international terms, a general lack of competitiveness was evidenced also confirmed by the low importance of the Portuguese export shares of the sector.

Keywords: Cluster; Maritime cluster; Competitive advantage; Competitiveness; Economic growth.

JEL codes: R11, R58, Q25, Q28

Resumo

O conceito de *cluster* e a sua influência na competitividade e desenvolvimento de regiões e países assumem-se como tópicos de crescente importância na investigação de estudiosos dentro e fora do campo económico. Desde o surgimento do conceito, vários estudos têm vindo a debruçar-se sobre os efeitos das economias de aglomeração em diversas atividades económicas nas dinâmicas de crescimento da produção e emprego.

Tendo por base esta literatura, neste trabalho pretende-se estudar o *cluster* marítimo português. Para tal, procede-se à análise da sua evolução recente, avaliando-se as alterações produzidas na vantagem competitiva tendo em conta os valores de exportações, preços e quotas de mercado.

Não obstante este tema ter vindo a ser objeto de um crescente relevo no discurso político e na comunicação social ao longo dos últimos anos, permanecem lacunas importantes no domínio estritamente económico. Neste contexto, este estudo contribuiu para uma perceção mais rigorosa e fundamentada da evolução recente do *cluster* marítimo em Portugal, suprimindo esta antiga lacuna da investigação.

As conclusões gerais do estudo indicam que apesar de ser objeto de um cada vez maior interesse político e dos *media* e da vantagem competitiva natural de que Portugal goza, o setor marítimo português tem vindo a diminuir a sua importância, tanto em termos domésticos como em termos internacionais. A nível nacional, notou-se um declínio generalizado em todos os indicadores considerados no estudo, e a nível internacional, foi evidenciado uma falta de competitividade global, confirmada também pela diminuída importância das quotas de mercado das exportações portuguesas do setor.

Palavras-chave: *Cluster*; *Cluster* marítimo; Vantagem competitiva; Competitividade; Crescimento Económico.

Códigos JEL: R11, R58, Q25, Q28.

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List of abbreviation:

EC – European Commission

EU – European Union

RCA – Revealed Comparative Advantage

UV – Unit Value

MS – Market Share

MV – Missing value

F&RA – Fisheries and Related Activities

SB&SR – Shipbuilding and Ship Repair

MT – Maritime Transports

GVA – Gross Value Added

GFCF – Gross Fixed Capital Formation

1. Introduction: motivation and research goals

The sea has played a key role on the development and international recognition of Portugal for centuries. Since at least the Discoveries, the sea has been a landmark of the country's history and cultural heritage.

In strict economic terms, the sea has also been an important source of progress. During the overseas expansion, it was the privileged means of communication between Portuguese territories, strengthening the country's importance, both economically and politically (Matias, 2005). Even before, during the XII and XIII centuries, the geographical location of the country, with ports located inside the European commercial routes connecting the most important commercial cities, boosted the Portuguese commercial navigation. In the 16th century, shipbuilding was a mark among manufactures, due to the high levels of capital and skill intensity. Moreover, national ports played an important role by intermediating the re-exports of the merchandise produced in other continents, which represented a significant share of Portuguese exports during this period. This intermediary position was very favorable to the country's domestic income, given the high profit margins of the most competitive-products, hardly replaceable, such as pepper and sugar. Lisbon assumed an important position during the 17th century, being at the center of the Portuguese external relations, as 77% of the imports and 75% of the exports were traded in the capital's port (Costa, Lains & Miranda, 2011).

Nowadays, there are around 9000 non-financial companies whose main businesses are dedicated to the fisheries industry, ship building and ship repair, and maritime transports (Banco de Portugal, 2015). If we also consider the activities that benefit from the proximity to the sea, such as accommodation, restaurants and recreational and cultural activities, the whole bunch of activities related to the sea were responsible, in 2013, for about 4% of the turnover of non-financial corporations in Portugal (Banco de Portugal, 2015). Besides, the maritime cluster's sectors and all the indirectly associated economic activities represented, in 2010, 2.5% of the Portuguese Gross Value Added (GVA) (Direção-Geral de Política do Mar, 2013). Such activities are thus of major social and economic importance.

This notwithstanding, only recently the economic exploration of the sea and related activities has received considerable attention. After a period of relative neglect, the sea has become the focus of several European Union (EU) policy documents. The European Commission (EC) has recently presented the "Action Plan for a Maritime Strategy in the Atlantic Area", that intends to establish the most beneficial means to take full advantage of the economic potential of the sea, bearing in mind its environmental sustainability (European Commision, 2013). This document followed previous efforts made under the "Marine Directive", which was created in 2008 to help countries to protect and promote the sustainable use of marine waters and resources (European Commission, 2015). The European policy on the ocean exploration affects most prominently Portugal, which is the country with the largest surface of jurisdictional waters located in the European Continent, nearly 19 times the surface of its territory (Salvador, 2013).

In terms of economic research of the Portuguese case, there is however a considerable lack of studies. To our knowledge, although several studies approach the competitiveness, innovation and development processes of maritime clusters in a number of countries (e.g., Langen, 2002; Doloreux and Shearmur, 2006; Chang, 2011), the Portuguese case has not yet been addressed.[1] This study attempts to fill this gap in the literature, providing an analysis of the role presently played by the Portuguese maritime cluster and assessing its economic potential, taking specifically into account its exports' capabilities.

Maritime clusters are composed by very heterogeneous activities: traditional ones, which include fishing (ISIC code 031) and aquaculture (ISIC 032), and more technology-intensive activities, such as shipbuilding (ISIC 301), ship repair (ISIC 3315) and maritime transports (ISIC 501). It is our purpose to analyze the evolution of competitive advantage regarding these activities and evaluate the economic relevance of this cluster, as well as its potential to create knowledge and innovation. We intend to explore the recent evolution of maritime activities in terms of exports and value-added, in an attempt to understand if an improvement has been made or can be foreseen in the near future. Thus, an attempt is made to answer to the following research questions:

[1] Salvador (2013) explores the connections between sectors within the Portuguese maritime cluster, analyzing the importance of each sector and of intersectorial linkages in terms of revenues. Still, the level of internationalization and competitiveness of the Portuguese cluster were not put under assessment.

- Has Portugal's (natural) competitive advantage in the sector been materialized in practice? (Q_1)

- How has been its evolution over time? (Q_2)

Such a research design is ultimately undertaken to provide insights on the competitive advantage of the Portuguese maritime cluster, which may become an important milestone to the country's overall building of competitiveness.

The findings of the study reveal a lack of competitiveness of the Portuguese maritime sector over the analysed years. This fact is confirmed both in national and in international scopes, as there is a decline in virtually all indicators considered. The firms of the sectors are found to be mainly micro-firms and from the sector of fisheries and related activities. There is a strong geographical concentration in Porto and Lisbon Metropolitan areas, Algarve, Aveiro, West and Azores. In international terms, the Portuguese maritime cluster and its activities perform, generally, poorly, as the exports shares have a low importance and there has been occurring a continuous comparative disadvantage in highly value added products and a consolidated comparative advantage in low processed and value added ones.

The dissertation proposal is organized as follows: Chapter 2 provides the economic literature background, addressing the concept of competitiveness (Section 2.1), the concept of cluster, its origins, the different perspectives of analysis and their evolution over time (Section 2.2), the relationship between clusters and the formation of competitive advantage - Section 2.3-, and the specificities of the maritime cluster – Section 2.4. Chapter 3 is dedicated to the political background on the theme, mainly in what concerns the European initiatives and funds (Section 3.1), and addresses the Portuguese scope in Section 3.2. Chapter 4 presents an overview of the Portuguese maritime clusters, assessing, *inter alia*, employment, turnover, gross value added and investment. Section 4.3 goes further into the assessment of the competitiveness of the cluster, based on the evaluation of the exports and applying indicators as market shares, unit values and revealed comparative advantage index. Chapter 6 concludes, pointing out the most important findings of the study, making a critical analysis of its limitations and pointing future research avenues.

2. Competitiveness, clusters and economic growth: a survey of the literature

2.1. The concept of competitivess

Competitiveness is a vague term. Several distinct definitions of the term exist, from different authors and institutions. Aiginger (2006), quoting Krugman (1994), states that the absence of an important theoretical background along with the use of the term in policy action turned it into an elusive concept, which may be "misleading or even dangerous" (Aiginger, 2006 p:162).

Being a widely used term within the scope of economics and management over several decades, its definition, indicators and sphere have been evolving over time, as different specialists assume distinct approaches to the topic. Table 1, adapted from Aiginger (2006), presents a summary of definitions on competitiveness from several authors and institutions.

Table 1: Different definitions of competitiveness

Source	Definition
Aiginger (1998)	"Competitiveness of a nation is the ability to (i) sell enough products and services (to fulfil an external constraint); (ii) at factor incomes in line with the (current and changing) aspiration level of the country; and (iii) at macro-conditions of the economic, environmental, social system seen as satisfactory by the people."
Competitive Policy Council (USA, 1994)	"The ability to sell products on international markets, while incomes in the domestic markets increase in a sustainable way."
European Commission (1998)	"An economy is competitive if its population can enjoy high standards of living and high rates of employment while monitoring a sustainable external position."
Fagerberg (1988)	"The ability of a country to realise central economic policy goals, especially growth in income and employment, without running into balance of payment difficulties"
IMD (1994)	"World competitiveness is the ability of a country to, proportionally, generate more wealth than its competitors in the world market."
OECD (1995)	"Competitive policy (…) (is) supporting the ability of companies, industries, regions and nations or supra-national regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis"
Orlowski (1982)	"the ability to sell"
Porter (1990)	"The only meaningful concept of competitiveness at the national level is national productivity."
Scott & Lodge (1985)	"(…) a nation state's ability to produce, distribute and service goods in the international economy (…) and to do so in a way that earns a rising standard of living."

Source: Adapted from Aiginger (2006 p. 166)

Balkyte and Tvaronavičiene (2010) emphasize the importance of competitiveness being seen as a result of both the economic and social environment of a country as "globalization, economic dynamism and social progress, sustainability and competitiveness go hand-in-hand" (Balkyte and Tvaronavičiene, 2010, p. 341).

To Aiginger (2006) "competitiveness is the ability to create welfare" (p. 165) and may be the result of different factors, both hard and soft. The hard ones are those considered in the traditional economic theories of competitiveness, such as labour, capital and technology, whereas the soft factors include skills, political stability, innovation, trust, among others. Welfare considerations, in turn, involve employment, political stability, safety and the sustainability of natural resources.

Moreover, the term can be used under different scopes: the firm, industry and regional/country level (Aiginger, 2006). Adopting the perspective of location on the theory of competitiveness, Kitson et al. (2004) suggest that regional competitiveness occurs when people and firms want to locate and invest in a given place. Following the same line of thought, Snieška (2015) asserts that the capacities to effectively deal and apply the competitiveness factors with the purpose of establishing a solid position comparing with other regions is the way to achieve regional competitiveness.

The sustainability of the competitiveness is also frequently taken into account. Feurer and Chaharbaghi (1994, p. 46) define competitiveness as "relative and not absolute. It depends on shareholder and customer values, financial strength which determines the ability to act and react within the competitive environment and the potential of people and technology in implementing the necessary strategic changes. It can only be sustained if an appropriate balance is maintained between these factors which can be of a conflicting nature".

Whereas some studies and researchers adopt the firm perspective, others stand for the idea that competitiveness has to do with regions and countries. Within the scope of the last perspective, Garelli (2009) points out four different pillars of competitiveness: *economic performance, government efficiency, business efficiency* and *infrastructures.* Inside these broad pillars, other dimensions are considered, such as employment, international trade and investment, business legislation, productivity, labour market, education, etc. Also taking into account the definition of some of the world's most important institutions and comparing these with other authors conception of competitiveness, heterogeneous viewpoints occur. From the over simplistic view of

competitiveness defined by Orlowski (1982) as "the ability to sell" (p. 70) to broader perspectives that cover all the scopes, from firms to nations, that involve the capacity of policies to support all the scopes and areas mentioned being able to guarantee high standards of living while maintaining strong and competitive international position (OECD, 1995). Sharing the same point of view, the European Commission (EU) (1998) stresses that the competitiveness of a nation is directly associated with the ability to assure both high standards of living and solid external situation. Salvatore (2016) refers to competitiveness as "the ability of a country or company to generate more wealth for its people than for its competitors in world markets" (p. 22)

From a brief review on the literature of what is in fact competitiveness, it is clear that whereas some consider it a concept and a status, others look at it as a process and a way that firms or countries have to find and follow. Besides, an idea of vagueness and lack of consistency and general agreement remains. It was, though, clear that concerning nations' competitiveness, the concept is closely related with economic growth that in turn is susceptible of being increased by enabling a more attractive environment for investment and entrepreneurship. Besides, and still within the same perspective of competitiveness of nations, it is broadly recognized that it is intrinsically connected with high and sustainable living standards and employment.

2.2. The concept of cluster

Strong processes of agglomeration of firms and industries have been the subject of interest among researchers since at least the introduction of the concept of "industrial district" by Marshall (1920a). Marshall defined it as "the concentration of large numbers of small businesses of a similar kind in the same locality" (Marshall, 1920a, p. 268), pointing out the advantages of being placed near other firms, namely, the access to markets of specific capabilities, where employers could find suitable workers and workers, in turn, could find the opportunity to do what they knew best, the increase of supplementary commercial exchanges, by some neighboring supply, and the access to specialized machinery. Marshall's seminal work provided the inspiration for more recent literature on clusters, such as Porter (1990, 1998 and 2003), de Langen (2002), Martin & Sunley (2003), Ellison, Glaeser & Kerr (2007), Doloreux & Shearmur (2009), Delgado, Porter & Stern (2010), Pinto, Cruz & Combe (2015), among others (Table 2).

Another important approach on the matter came from the "Location Theory", which attempted to uncover the main factors underlying firms' location. In his 1929 seminal work – "Stability in Competition" – Hotelling adopts the spatial framework to illustrate the diversity among agents, as in the classical example of electoral competition (Jacques-Françoies, 2008). He explains the dynamics involved in the spatial competition between firms, taking into account the influence of agglomeration and dispersion forces. Consumers were seen as "dwarfs", adopting a competitive behavior, whereas firms were "giants", assuming a strategic behaviour which was capable of molding the market. Due to spatial competition, the model predicts that firms tend to locate in the centre of the market at the initial stage, but in consequence of dispersion and agglomeration forces, location will tend to evolve over time (Jacques-François, 2008). [2]

Following Marshall and Hotelling's works, other authors and theories have appeared, holding different views. From the proliferation of theories, many definitions of clusters have emerged, but in all cases a link between economies of agglomeration and competitiveness is established.

Some authors emphasize the role played by cooperation and mutual help within clusters. Pyke, Becattini and Sengenberger (1990) define industrial district as "a socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district (…) community and firms tend to merge" (p. 38). By doing so, they add firm dynamics to the original definition of Marshall, stressing the "internal interactions of a system of small manufacturing firms, involved in different phases of the same production process, spatially concentrated, closely linked to the local population and sharing a relatively restricted territory" (Pyke, Becattini and Sengenberger, 1990, p. 106).

Porter, in turn, accentuates the geographical proximity. Clusters are viewed as "geographic concentrations of interconnected companies and institutions in a particular field" (Porter, 1998, p. 78), being major determinants of a country's competitiveness and prosperity. In his words "a nation's competitiveness depends on the capacity of its industry to innovate and upgrade. Companies gain advantage against the world's best

[2] In Hotelling's classical example, ice-cream sellers try to find the best location for their businesses and end up stablishing themselves closely in the center of the beach, each one serving 50% of the customers. In this location, sellers are able to get a Nash Equilibrium, which is the optimal strategy of a player taking into account every other players' strategies, where no additional adjustment would be profitable (Finance, 2015). According to Hotelling, this is how a cluster is created, and each company benefits from belonging to it, by becoming less vulnerable to competition (Jacques-Françoies, 2008).

competitors because of pressure and challenge" (Porter, 1990, p. 73). In this sense, Porter's approach differs from previous analyses that emphasized natural resources, workforce, currency values and interest rates as major sources of prosperity. The richness of a country is not inherited, but is created by firms, by building capabilities to handle demanding environments. The best players within an industry take advantage of the interaction with tough domestic market's rivalry and sophisticated local customers. Countries' competitiveness is influenced by history, culture, values, institutions and economic composition. Since a nation cannot be competitive in every industry, nations will shape their own path, and compete successfully in different industries (Porter, 1990).

An interesting feature emphasized by Porter regards the relative antagonism between globalization and localized factors of competitiveness. While some would argue that globalization is reducing the significance of location, Porter defends precisely the opposite: "The enduring competitive advantages in a global economy are often heavily localised, arising from concentrations of highly specialised skills and knowledge, institutions, rivalry, related businesses, and sophisticated customers. Geographic, cultural, and institutional proximity leads to special access, closer relationships, better information, powerful incentives, and other advantages in productivity and innovation that are difficult to tap from a distance. The more the world economy becomes complex, knowledge based, and dynamic, the more this is true." (Porter, 1998, p. 90).

According to this view, firm's economic success is intimately linked to the exploration of the factors incorporated in the "Diamond of National Advantage": Factor Conditions, Demand Conditions, Related and Supporting Industries and Firm Strategy, Structure and Rivalry (Figure 1).

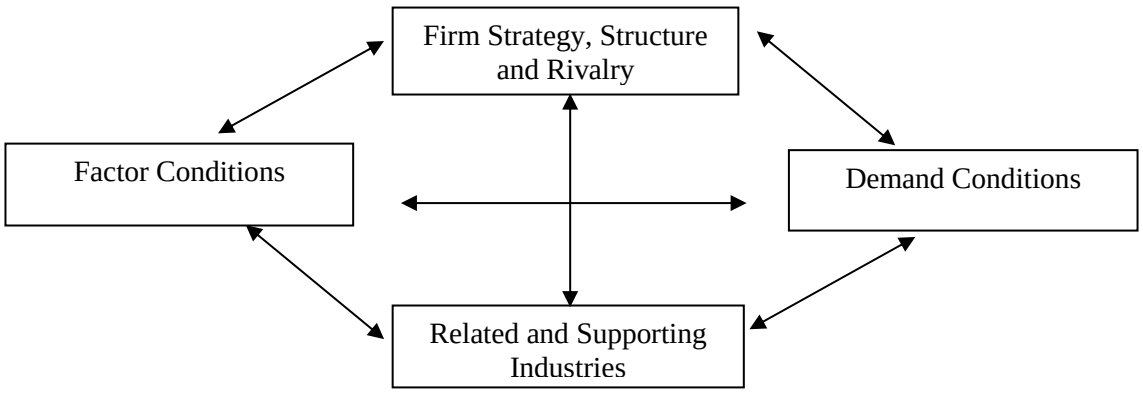

Figure 1: Porter's Diamond (Porter, 1990)

There are two elements that have the ability to transform the diamond into a *system*: the domestic rivalry and geographic concentration. Domestic rivalry reinforces all diamond features, by pushing companies to upgrade, for instance, by developing more qualified resources. Geographic concentration, on the other hand, promotes efficiency and specialization, attracts qualified workers and other resources and intensifies the volume and the quality of shared information, increasing the diffusion of knowledge and innovation processes (Porter, 1990).

Porter associates modern competition with productivity. In order to become productive, firms need to make use of adequate technology, advanced methods and invest in distinctive products or services Strong competitive advantages are directly influenced by the business environment in which firms operate. In advanced economies, such an environment is built and shaped mainly by cluster specific decisive aspects, which tend to foster competition (Porter, 1998).

Moreover, the notion of competitiveness is inherently dynamic. Firms need not only to get competitive advantages, but they have also to struggle to maintain competitive. In this context, clusters are seen as "critical masses – in one place – of unusual competitive success in particular fields. Clusters are a striking feature of every (…) economy, especially in more economically advanced nations" (Porter, 1998, p. 78). Although companies' internal environment remains relevant, external environment provided by clusters has a huge importance on the competitiveness of companies, as "innovation and competitive success in so many fields are geographically concentrated" (Porter, 1998, p. 78).

Porter's cluster theory has a markedly applied nature and this feature is also visible in the work of Rosenfeld (1997), whose broad goal was to present a definition and a model for better understanding clusters. In order to accomplish this goal, the author assembled 26 individuals (academics and policy makers, among others), who had some experience in working with clusters. He then came up with the following definition of clusters: "A geographically bounded concentration of interdependent businesses with active channels for business transactions, dialogue, and communications, and that collectively shares common opportunities and threats" (Rosenfeld, 1997, p. 10). A related notion is provided by the OECD in a 1999 study, in which clusters are seen as "economic networks of

strongly interdependent firms linked in a value adding production chain. Firms almost never innovate in isolation." (OECD, 1999, p. 330).

Langen (2002, p. 210), in turn, provides a different perspective to the understanding of clusters, defining them as "a population of geographically concentrated and mutually related business units, associations and public (private) organizations centred around a distinct economic specialization". From Langen's point of view, there are few features that allow one to define a cluster, such as the fact that a cluster does not constitute an entity but a *population*. Therefore, it is crucial to bear in mind that clusters are heterogeneous and spatially concentrated and that is why they differ from networks. Also, a cluster's population is composed of organizations, associations and other entities whose area of operation is related to the cluster's core activities that must be focused on a specific area of economic specialization (Langen, 2002).

A related approach to the concept of cluster has been put forward by Ketels (2003), who sees clusters as "groups of companies and institutions co-located in a specific geographic region and linked by interdependencies in providing a related group of products and/or services" (p. 3-4). Ketels goes a step further in the clusters' characterization, by separating different types of clusters. For instance, clusters diverge due to the type of products or services they are dedicated to, the dynamics they experience within their location, the development stage they are facing and the business environment from where they are placed.

In a nutshell, it is not an easy task to define clusters, since several different interpretations exist. One of the most influential ones is, clearly, that developed by Porter: his notion "has rapidly become the standard concept in the field" (Martin and Sunley, 2003, p. 6). However, there is some vagueness in the concept, which makes more difficult its operationalization (Ketels, 2003; Chang, 2011). It is difficult to delimit a cluster, understanding where it begins and where it ends. Should one use the geographical borders, or other instrument to indicate a cluster's limits? Should one consider it as a mega-cluster or a micro-cluster? The issues related to the operationalization of clusters will be explored in more detail in Section 2.3.

Table 2: Different definitions of clusters

Concept	Designation	Author/Year
Industrial District	"The concentration of large numbers of small businesses of a similar kind in the same locality"	Marshall, 1920a
Industrial District	"A socio-territorial entity which is characterised by the active presence of both a community of people and a population of firms in one naturally and historically bounded area. In the district (…) community and firms tend to merge"	Pyke, Becattini and Sengenberger 1990
Clusters	"Geographic concentrations of interconnected companies and institutions in a particular field"	Porter 1998
Clusters	"A geographically bounded concentration of interdependent businesses with active channels for business transactions, dialogue, and communications, and that collectively shares common opportunities and threats"	Rosenfeld 1997
Clusters	"Economic networks of strongly interdependent firms linked in a value adding production chain. Firms almost never innovate in isolation."	OECD 1999
Clusters	"A population of geographically concentrated and mutually related business units, associations and public (private) organizations centred around a distinct economic specialization"	Langen 2002
Clusters	"Groups of companies and institutions co-located in a specific geographic region and linked by interdependencies in providing a related group of products and/or services"	Ketels 2003
Clusters	"is a specific type of network – a geographic agglomeration of companies that are vertically and horizontally linked by channels for business transactions, cooperation and/or competition"	Laaksonen and Mäkinen 2013

Source: Own elaboration

2.3. Clusters and competitive advantage

Currently, competition is mainly about productivity and innovation. Productivity depends "on *how* companies compete, not on the particular fields they compete in" (Porter, 1998, p. 80), which means that any firm is able to be competitive, as long as it applies adequate methods and technology and provides differentiated products and services, regardless of the industry in which it operates. The degree of firms' competitiveness is firmly associated with the business environment in which they locate. In order to provide an adequate logistical system, the firm's location has to offer advanced transportation amenities. In a similar vein, for a firm to successfully compete on refined services, it has to hire qualified workers. These constraints are transversal to all industries and are more easily overcome if the company is placed in a cluster.

Belonging to a cluster enables firms to have a closer and easier access to inputs, information, technology and institutions. It also allows the establishment of networking with other companies and stimulates business upgrading. By being geographically close to employees and suppliers, firms may take advantage of the existence of a range of qualified and specialized workforce, which diminishes recruitment costs. The existence of a labour pool within the boundaries of the cluster decreases the cost of searching for qualified workforce and "allows for the existence of specific training and education programmes, which upgrade the quality of the labour pool" (Langen, 2002, p. 211). The nearness of customers and suppliers, with whom companies are able to develop a closer relationship, due to more common personal contacts, is also beneficial. Moreover, closer proximity is reflected in cost advantages, due to reduction of transport costs. Firms belonging to clusters also benefit from knowledge spillovers that are spread in a swift way because of the regular and intense interaction between firms and institutions (Langen, 2002).

Summarizing, Ketels (2003) argues that the economic importance of clusters relies on the capacity of creating economic benefits at three distinct levels. First, firms are able to operate more efficiently, due to the access to more functional and specialized inputs and suppliers, as well as the possibility to diminish response time. Secondly, firms within a cluster are capable of reaching higher innovation levels since they are embedded on a dynamic, competitive and innovative environment. Finally, the cluster environment is

propitious for the creation of new businesses, increasing the level of entrepreneurship of a region or a country.

Clusters may also affect competitiveness in some other ways. According to Porter (1998), belonging to a cluster means a faster access to information and the creation of closer ties between members, strengthening the sense of community and the stream of information. As companies' activities within clusters are frequently interconnected and dependent, when a company succeeds, the others may be stimulated, and many other advantages from complementarities may be accomplished, such as the possibility of offering complementary products or services that meet clients' requirements. Finally, belonging to a reputed cluster enables companies to take advantage of the reputation of the whole community and overcome possible constraints faced by standalone firms in building reputation.

Furthermore, within clusters, firms are given the access to several common mechanisms in marketing, such as the existence of marketing delegations, and, among others, the participation in commercial events. From the customers' point of view, it may be more advantageous to purchase from a cluster than from an independent and isolated company, due to the variety of possible alternative suppliers in that specific location. A well-structured cluster is able to attract both public and private investment, which can raise the productivity of companies, for instance through the creation of "training programmes, infrastructure, quality centers, testing laboratories" (Porter, 1998, p. 83) that may better prepare employees and processes and make them more efficient.

Also, the high levels of rivalry of clusters, as they experience a high pressure by the natural comparisons established inside the clusters, may be an important source of development in itself (Porter, 1998). Firms' performances are compared and measured in a more simple manner since local competitors perform related business activities, which may foster the adoption of more competitive behavior. Through the monitoring of other firms, managers are able to have a more clear view of their own performance, improving management. The cluster may be more easily known internationally and build a sounder repuatation within the financial sphere.

Basically, industrial and local clusters play an important role on the competitiveness of the countries and in the creation of value, being important drivers of national welfare (Benito, Berger, de la Forest, & Shum, 2003). Clusters may increase competitiveness by implementing shared projects associated with innovation and education (Enright, 2003).

They may act as an innovation booster particularly in small and medium enterprises (SME), providing productivity increases and contributing to job creation and to the emergence of new ideas and businesses (Doloreux & Shearmur, 2006). Nonetheless, clusters are not always the best solution to regional economic difficulties, as some regions are unprepared to manage a functional and successful cluster. Moreover, it is difficult in policy terms to simply "implement" a cluster, as it emerges from endogenous forces. In addition, it is advisable to design different strategies and policies for the diverse sectors and activities that form the cluster, because general policies and actions tend to be ineffective (Doloreux & Melancon, 2008).

Laaksonen and Mäkinen (2013) studied the maritime clusters in the Baltic region, mainly in what concerns their competitiveness and the elements that may affect it from a Finish perspective. Considering especially the shipbuilding industry as the core of the maritime cluster, some of the challenges faced by it are pointed in this study, such as the fact that shipbuilding industries in these regions are competing against South Korea and China for the leading of the world market. The main challenge is facing the competitive advantages of both China and South Korea's shipbuilding industries that are totally based on coast leadership, whereas Baltic shipbuilding industries offer higher prices for higher quality and technological equipments. The study also states the advantages of the organization of these activities within a cluster, as being part of a well-functioning infrastructure, the presence of specialized inputs, or at least the possibility to get less expensive and high-quality inputs, whether technological infrastructure, human or capital resources, among many others.

The study of Doloreux, Shearmur and Figueiredo (2016) intends to evaluate the relatedness between the maritime cluster's policies and strategies in the coastal region of Quebec and the growth in the employment, mainly the skilled-intensive employment. Contrary to the previously exposed studies, this understands that at least on the analysed area, cluster policies had poor results and effectiveness, as the range of higher skilled employment is not being materialized. Despite this, the authors recognize the positive effects of belonging to a cluster and the positive regional effects clusters provide, such as fostering regional prosperity, and stimulating regional economic growth.

Stavroulakis and Papadimitriou (2016) found a correlation between clusters and financial outputs, and indicate that the organization in clusters may be related to the higher performance of the firms and innovation improvement and meet confirmation of the peers

"Within industrial cluster literature, there is a near mutual agreement that clusters foster competitivess" (p. 3).

2.4. The maritime cluster

The "blue economy" (Pinto, Cruz, & Combe, 2015), which is composed by several sectors and activities related to the sea, has increasingly been the subject of an important discussion in European policy making. One of the main reasons for this is associated with the opportunities related to maritime economic exploration. The sectors related to the exploration of the sea are responsible for 3% to 5% of the Gross Domestic Product (GDP) of EU countries, and are capable of giving a substantial contribution to the improvement of the competitiveness in this region (Pinto et al., 2015).

The concerns about the management of maritime activities among European countries contribute substantially to the emergence of the "Atlantic Area identity", which crosses the economic and socio-cultural angles, and focuses on the land and endogenous resources as well. Across the European nations within the Atlantic Area, there are two central purposes and intentions: revitalise the traditional maritime sectors, such as fisheries, which have been facing sustainability and competitiveness issues, and develop procedures of investment in maritime activities with high potential of growth, such as ocean renewable energy. Both these missions require innovation regarding the process, product and markets (Pinto et al., 2015).

The European Commission has been devising incisive policies related to the sea and its exploration. "The Action Plan for a Maritime Strategy in the Atlantic area", created in 2013, defines the priorities for the strategic actions held in Portugal, Spain, France, Ireland and the United Kingdom. Under this setting, these member states have the chance to design their own strategies and set their path for sustainable maritime growth, based on targeted investment, research and high skills, with more qualified workforce. The Action Plan aims to promote innovation, entrepreneurship and accessibility, protect the maritime environment and develop a basis for sustainable regional upgrading, always considering the harnessing of the Atlantic marine potentials (European Commission, 2013).

Innovation is, therefore, a key aspect for the evolution of the economic activities related to the sea. The study made by Pinto et al. (2015) evaluates the link between the emergence of clusters with innovation, human and social capital, and gives important insights on the determinants of innovation and cooperation and on its importance to the achievement of "blue" growth. Given their importance to regional development, emerging maritime clusters are nowadays an important topic of the policy-making discussion, seen as strategic assets to economic growth and national development in general (Pinto et al., 2015).

The Maritime Cluster Organizations have been playing an important role regarding the evolution of the Maritime Industry in coastal regions and countries. As indicated earlier, the existence of clusters is related with the perception of benefits that actors find about being close to relevant firms or institutions which can lead to the building of significant business relations and cooperation. Accordingly, the main motives for the establishment of a National Maritime Cluster Organization are essentially related to the intensification of competitiveness, the recognition, promotion and strengthening of the Maritime Cluster itself, as well as the improvement of coordination inside the cluster (Viederyte, 2013).

Academics have been expressing increasing interest on the analysis of maritime clusters throughout the world, exploring its essential components, the interdependencies and the potentialities related to them, as well as evaluating its strategic importance to regional and national development and its economic meaning in terms of economic growth. A few examples are given below, reflecting different countries' experiences.

Although the topics addressed are all interrelated with the maritime clusters, studies differ on the delimitation made of the maritime cluster. Some see the maritime industry as being composed of different sectors that "have to do with the building or operation of ships. Activities strongly related to building and operating ships, such as port services, maritime services and ship suppliers are included in the cluster" (Langen, 2002, p. 213). Nonetheless, there are other authors who hold different views on what defines a maritime cluster. For instance, Kwak, Yoo and Chang (2005) consider the maritime cluster as being composed of every sector whose dominion is associated with maritime activities. These are: Marine transportation, Harbor, Fishery and marine products, Shipbuilding and Other marine sectors.

Due to the difficulty of defining clusters, and in spite of the existence of several works on the matter, there is no unanimous understanding of what constitutes the maritime cluster.

Consequently, the results are not directly comparable. For instance, according to Porter (2003), in the United States there are some clusters related to the exploration of the sea, such as *Fishing and Fishing* products, with some subclusters such as *Fish products, Fishing and hunting, Processed seafoods* and *Seafood distribution and wholesaling*. Other subclusters related to the sea are identified by Porter within the major cluster of the *Transportation and Logistics:* the *Marine transportation* and *Ship building*. All those mentioned are considered separately and are not aggregated in a single mega-cluster (Porter, 2003).[3]

The SAER (Society for the Evaluation of Companies and Risk), entity which has recently assessed the potential of the Portuguese maritime cluster, presents a distinct approach. According SAER, a cluster is more than an agglomeration of companies exploring interrelated activities. It is composed of several different actors, such as, among many others, companies or research centers, which operate in a set of sectors that establish important economic and technological relations among each other. These interactions create a great potential for development and innovation that would not be achievable if the members were standalone. Conversely, a hypercluster is described as a set of clusters that may not have compulsorily economic or technological relations between them, but that emerge because they explore the same resource and share the same environment (SAER, 2009).

When talking about a mega-cluster or a hypercluster, one is referring to a phenomenon that includes several distinct activities, such as shipyards, insurance, tourism or fisheries, and that crosses several countries and areas, such as finance and environment (Salvador, 2014). Whether talking about a local, regional or interregional, micro or mega clusters, the delimitation "is not 'natural'" (Langen, 2002, p. 210), since clusters are in fact "*constructed* both by scientists and by practitioners". The *construction* starts with the determination of the cluster core, which must may depend on the close existence of other economic activities. Spatial concentration may be identified by the presence of several firms operating in the same industry, the substantial portion of an industry in the gross regional product and the existence of a considerable amount of exports (Langen, 2002).

[3] A mega-cluster is "a group of economic sectors that calls upon a set of complementary capabilities and to network associations" (Salvador, 2014, p. 54).

Without having a single and uniform delimitation of maritime cluster, the studies here analysed consider different sectors and activities, thereby invalidating a direct cross-comparison of the distinct countries' maritime clusters.

Benito *et al* (2003), for instance, studied the impact of the maritime cluster in the Norwegian economy. The maritime industry is a sector of strategic relevance for Norway, accounting for about one half of the exports of services. The Norwegian maritime cluster is well known for its dynamics and innate innovation and entrepreneurship. In this case, the authors consider the Ship Industries (ship yards, shipbuilding and associated actors and industries) and Shipping (shipping companies and other shipping services) as the constituents of the country's maritime cluster. The results highlight the growth of the maritime sector, its international competitiveness and substantial cluster-related strengths, such as *diversity*, *rivalry* and *completeness* (Benito *et al*, 2003).

In another work, based on the Canadian experience (Doloreux and Shearmur, 2006), three maritime clusters are considered in three distinct regions: Quebec, Newfoundland and Labrador and British Columbia. The authors define the maritime cluster as being composed by following sectors: Aquaculture, Commercial fisheries, Shipbuilding and equipment, Fish and seafood production, Marine biotechnology and Marine technology. In this study, the authors find that Canadian firms from the maritime industry are not strongly committed to innovation processes, with only a few ones showing some action directed towards product and process innovation. Firms tended to innovate merely by acquiring equipment and machinery and by training their employees. Some obstacles were identified as being responsible for the lack of innovation, such as the high investment needed to buy new machinery and the regulations related to the industry. Other structural constraints were related to the poor development of the Canadian Maritime Cluster, such as the maritime firms' strong dependency on the domestic market and the weak collaboration with other firms, institutions and organizations. In this context, although the Canadian maritime industry is generally seen as a possible source of competitive advantage, some caveats have to be overcome in order to become so. Interestingly enough, it was also found that the firms that were more strongly related to innovation and Research and Development (R&D) belonged to clusters.

In a work dedicated to the study of the maritime cluster in the South West of England, Chang (2011, p. 489) defines the maritime cluster as a "network of firm, research, development and innovation units and training organisations, sometimes supported by

national or local authorities, which cooperate with the aim of technology innovation and of increasing maritime industry's performance." The industries constituting the maritime cluster include all "(…) enterprises engaged in the business of designing, constructing, manufacturing, acquiring, operating, supplying, repairing and/or maintaining vessels, or component parts thereof: of managing and/or operating shipping lines, stevedoring and customs brokerage services, shipyards, dry docks, marine repair shops, shipping and freight forwarding services and similar enterprises" (Chang, 2011, p. 489). The transport sector thus is seen as an important part of the maritime cluster and one which, in the aforementioned study, needs to be reorganized in order to revitalize the region's port infrastructure.

From the analysis of the different studies about maritime clusters, one experience the difficult of clearly understand what sectors and economic activities are included on the maritime cluster itself. A problem with defining the borders of the maritime cluster is that it is increasing over time, comprising a wider great range of services, activities and products (Doloreux & Melancon, 2008). Moreover, the constituents of the maritime cluster are not obvious and may include activities which are not directly related in economic terms: "Some activities are tightly interwoven, while others are more stand-alone" (Langen, 2002, p. 214). This explains why some sectors related to the sea in the Netherlands and in Canada were considered independent from each other. Also, this seemingly "unrelatedness" may constitute a constraint to the development of the full potential of the maritime cluster because of the difficulties in knowledge sharing (Doloreux & Melancon, 2008). Table 3 provides a synthesis of the different empirical views on the clusters' composition, based on the surveyed studies.

Table 3: Empirical studies on maritime clusters

Author(s)/ Year	Country/ regions	Period	Theoretical Basis	Aim of the study	Industries included in the Cluster
Doloreux, Shearmur (2009)	Canada: Quebec, Newfounland and Labrador and British Columbia	2006	Marshall (1920b) Porter (1998; 2003) Rosenfeld (1997)	Analysis of the stage of development of each cluster and the impact of cluster policies in its competitiveness	• Aquaculture; • Fisheries and transformation of marine products; • Naval construction; • Marine equipment; • Marine science and technology; • Other related marine activities
Doloreux, Melançon (2008)	Canada - Quebec	2007	Porter (2000) Maskell (2001)	Explore the sort of innovation activities in the maritime industry and its evolution concerning its location within a cluster	• Aquaculture; • Commercial fisheries; • Shipbuilding and equipment; • Fish and seafood production; • Marine biotechnology; • Marine technology
Chang (2011)	South West of England	2010	Porter (1998) Languen (2002) Ketels (2003)	Point out and analyse the main features of the maritime clusters in the Region and suggestion of the most competitive sectors within the cluster	Firms engaged in "the business of designing, constructing, manufacturing, acquiring, operating, supplying, repairing and/or mantaining vessels, or component parts thereof: of managing and/or operating shipping lines, stevedoring and customs brokerage services, shipyards, dry docks, marine repair shops, shipping and freight forwarding services and similar enterprises" (Chang, 2011, p. 489)
Benito, Berger, Forest and Shum (2003)	Norway	1999-2000	Porter (1990, 1998)	Analysis of the Norwegian maritime cluster and statement of the determinants of its competitiveness	<u>Ship Industries:</u> • Ship yards; • other actors in ship industry; <u>Shipping:</u> • Shipping companies; • Other shipping services
Salvador (2013)	Portugal	2013	Porter (1998)	Evaluation of the strength of the linkages/interactions between the sectors within the portuguese maritime cluster	• Fish processing and commercialization; • Recreational boating; • Maritime Ports; • Maritime transports; • Navy; • Ship rapair; • Shipbuilding; • Fisheries and aquaculture
Langen (2002)	The Netherlands	2001	Marshall (1920b) Krugman (1991)	Assessment of the performance of the cluster	• Shipping; • Shipbuilding; • Offshore; • Inland waterways; • Dredging; • Ports; • Navy; • Fishery; • Maritime services; • Yacht industries; • Maritime suppliers.

3. The economic policy of the sea in the period under analysis: major trends and features

3.1. The European Context

During the last decades, there has been an increasing interest on the sea and its exploration by political agents, with the emergence of a number of policy plans and initiatives addressing the matter.

Oceans are currently seen as a new economic border, due to the incredible potential of wealth creation, innovation and employment (OECD, 2016). But at the same time, oceans are deeply threatened by pollution and climate changes, among many other risks. In this context, political institutions have made an effort in the past decades to create legislation to allow nations to take full advantage of its jurisdictional waters, while promoting sustainable economic growth.

Within Europe, several measures have been put in practice in order to regulate maritime resources. The European continent is bordered by two Oceans and four different seas: the Atlantic Ocean, on the East, the Arctic Ocean, the North Sea and the Baltic Sea in the North, the Black Sea in the East and the Mediterranean Sea in the South. The European Union (EU) has a number of member states with outermost regions in the Atlantic – Madeira and Azores (Portugal), Canary Islands (Spain), and French Guiana (France) -, in the Indian Ocean – Mayotte, Réunion (France) - and in the Caribbean Sea – Guadeloupe, Martinique and Saint-Martin (France). Over 70% of the external borders of the European Union are made by water, as 23 of the 28 member states have coastal areas (EUROCID, 2016). These are only a few reasons why the sea is such an important asset to the European countries and why it is so important to address its potential.

The first mega European policy on the sea, the Common Fisheries Policy, was initially planned in the Treaty of Rome and implemented in the 1970s. It regulates fisheries and the exploitation of maritime natural resources, in order to protect the sea species, the maritime environment and improve the quality of the sea food (European Parliament, 2016). Although the general objectives remain unaltered since its inception, the concern with the environment and sustainability gained special emphasis in the last updates of this policy, particularly in 2003 and 2014.

In its early beginnings, the Fisheries Policy was part of the Common Agricultural Policy, but due to the growing importance of the subject, its constant updating and the geographical enlargement of the Community, along with the creation of the Exclusive Economic Zones (EEZ), it became an independent policy body (European Parliament, 2016). Being a *Common* policy, rules are made at the EU level and must be applied and respected by every member state of the Community.

The reform of the Fisheries Policy in 2002, implemented in 2003, introduced some relevant topics on the sustainability of marine ecosystems. The previous regulations were perceived as ineffective, as several fish stocks were in serious danger of disappearing. Three different regulations were created in order to overcome the problem, one on the sustainable exploration of fishing resources, another on the detailed information about Fisheries sector's structural support and the last one on the improvement of fishing conditions in terms of security and the use of new technologies. This reform also created *multiannual recovery plans* to protect the fishing species that were at risk of extinction and *multiannual management plans* to guarantee the safe exploration of other species. Finally, the creation of the Regional Advisory Councils, joining experts, consumers, authorities, fishermen and many other entities linked to the sea exploration, was another relevant measure carried out, as it gave stakeholders the possibility to join forces and more easily reach the responsible European institutions (European Parliament, 2016).

As the 2002 reform delivered poor results concerning the sustainability of fish stocks, a new approach has been initiated in 2009 with the publication of the Green Paper (EUR-LEX, 2006), and the launching of a new version of the Common Fisheries Policy in January 2014, which established the main goals for fisheries in 2020. This reform introduced important measures regarding overfishing and against the discarding of unwanted or inappropriate catches. Besides, important steps have been taken regarding the identification of the Atlantic species that have to be caught in a sustainable way. The document identifies a total of 27 species of this kind, whereas in 2009 the identified species were only 5 (EUROCID, 2016).

The new policy was determined in order to reach the key intention of the policy, which is to guarantee the environmental sustainability of the maritime areas in the long term and generate employment, economic and social gains. Within this reform, a new regulation appeared on the creation of a "common organisation of the markets in fishery and aquaculture products" (European Parliament, 2016), which intends to enhance the

competitiveness of the industry and foster transparency among producers and markets. Additionally, consumers also benefit directly from the Common Fisheries Policy, due to the implementation of new labelling rules, which give more detailed information, helping consumers to make better purchasing decisions. Finally, a new fund was established, the European Maritime and Fisheries Fund, which is discussed later in this study, which is a relevant mechanism to support countries implementing the new and demanding rules from the new policy framework (European Parliament, 2016).

In order to help European countries to explore natural maritime resources in a sustainable manner, the EU created several financial support mechanisms, which constitute one of the five *European Structural and Investment Funds.* Figure 2 presents the time line of the European funds related with fisheries.

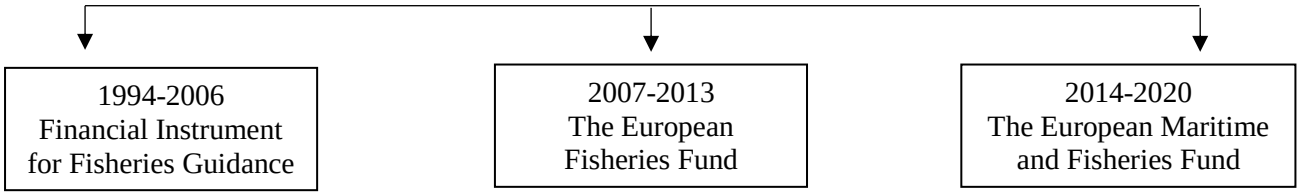

Figure 2: Time line of the main European funds

Source: European Commission

Initially created in 1994, the *Financial Instrument for Fisheries Guidance* (FIFG), which gained special relevance in 1999, established the priorities and the fields of intervention on the sectors of fisheries and aquaculture for the period between 2000 and 2006. The main goal was to help countries accomplish the goals of the Common Fisheries Policy and transform the firms and related entities into more competitive actors, through innovation. Other structural measures of the fund intended a safe balance between the resources and its exploration, improving the value added of the products and strengthen the geographic areas strongly dependent on these sectors. Through FIFG, European authorities meant to provide the best conditions for the development of the sector to reach a deep transformation. To do so, some areas of intervention were pointed out and the measures suitable to receive financial intervention were those listed below (Table 4) (EUR-Lex, 1999).

Table 4: Areas of intervention of the Financial Instrument for Fisheries Guidance

Fleet renewal and modernisation of fishing vessels
Adjustment of fishing effort
Joint enterprises
Socio-economic measures
Protection of marine resources in coastal waters
Small-scale coastal fisheries
Socio-economic measures
Protection of marine resources in coastal waters
Aquaculture
Fishing port facilities
Processing and marketing of fishery and aquaculture products
Seeking new outlets for such products
Operations by members of the trade
Innovative actions, in particular those of a transnational nature and involving the networking of operators and areas dependent on the sectors
Technical assistance

Source: EUR-Lex (1999)

The sea economy topic gained more emphasis during the Portuguese Presidency of the EU, consecrated in the *Lisbon Strategy* or *Lisbon Agenda*, established during the Lisbon European Council in March 2000. This strategy set out the objectives for the EU as a whole and correspondent mechanisms for the period between 2000 and 2010. The ultimate strategic goal was to transform the European Economy into the most competitive and dynamic economy of the world. Therefore, the general points of this strategy had to do with the strengthening of the economy and of social cohesion through job creation and the adoption of new policies for the improvement of innovation and competitiveness (Consilium Europa, 2000)

As the oceans were perceived as an important asset to achieve the goals set by the Lisbon Strategy, the Treaty of Lisbon, celebrated in 2007, dedicated some attention to these topics. On its title I "Categories and areas of union competence" it establishes:

Article 2 B

1. The Union shall have exclusive competence in the following areas:

(...)

(d) the conservation of marine biological resources under the common fisheries policy;

Article 2 C

2. Shared competence between the Union and the Member States applies in the following principal areas:

(d) agriculture and fisheries, excluding the conservation of marine biological resources; (EUR-Lex, 2007, p. 21)

Also the Treaty on the Functioning of the European Union (TFEU) determines, on Article 43, no. 3:

> *"The Council, on a proposal from the Commission, shall adopt measures on fixing prices, levies, aid and quantitative limitations and on the fixing and allocation of fishing opportunities"* (EUR-Lex, 2012, p: 65)

Therefore, there are competences shared among nations and other competences that belong exclusively to the Union. Each member state is not allowed to freely exploit its waters and resources, as they accept the European management of the national fishing resources, being limited by the European rules (e.g., catch quotas). On the other hand, there are structural funds available to the investment of the activities of the sector.

Also, under the frame of the Lisbon Strategy, the EC published in 2006 the Green Paper "Towards a future Maritime Policy for the Union: a European vision for the oceans and seas" which describes the different domains of the European common maritime policy. Its main goal was to provide economic and social growth through sustainable exploration of the maritime resources. The Green Paper defended an environmental-friendly, innovative and competitive maritime industry and pointed out new mechanisms and tools for maritime management. Being aware that the maritime sectors were responsible for 3% to 5% of the EU Gross Domestic Product, the Green Paper highlighted some serious problems of the maritime environment, such as pollution, decrease in biodiversity, overexploitation of resources and climate changes. In this regard, a new strategy was set, which included the reinforcement of the maritime security legislation, the establishment of risk assessment in the implementation of laws and the support to European countries in the management of water resources. It also recommended the improvement in the

qualification of the workforce and of cluster formation, stressing the positive roles played by cooperation and network organization (EUR-Lex, 2006)

Subsequently, the *European Fisheries Fund* (EFF) applied an amount of €4.3 billion in the support of coastal areas and maritime industry in the adjustment to new challenges and in the increase in competitiveness between 2007 and 2013 (Table 5).

Table 5: The European Fisheries Fund priority axes

Adjustment of the fleet (e.g. to support scrapping of fishing vessels)
Aquaculture, processing and marketing, and inland fishing (e.g. to support the shift to more environmentally friendly production methods)
Measures of common interest (e.g. to improve product traceability or labelling)
Sustainable development of fisheries areas (e.g. to support diversification of the local economy)
Technical assistance to finance the administration of the fund.

Source: European Commission (2016h)

The European Fisheries Fund dedicated special attention to the fishing communities that had to deal with severe transformation of the fishing industry (European Commission, 2016h).

Under the *European Integrated Maritime Policy*, from the responsibility of the Directorate-General for Fisheries and Maritime Affairs, the European Commission (EC) has been developing several policies, initiatives and strategies of management, exploitation and conservation of the marine environment (Table 5). Launched in 2008, the *Marine Strategy Framework Directive,* serves the environmental angle of the subject, aiming to establish common foundations to deal with the conservation of the European marine environment until 2020 (EUROCID, 2016).

The ultimate purpose of this Directive is, along with the conservation of the marine environment, to make sure oceans are sustainably explored so that future generations do not suffer from the lack of these natural resources. In this sense, European countries have to implement sustainable management action plans supported by the EU responsible bodies (EUROCID, 2016).

In this regard, the *Sea Basin Strategy*, created in 2007 by the European Commission, was launched with the main purpose of helping the outermost regions from Portugal, Spain and France to overcome development and sustainability challenges, such as remoteness, climate conditions, reduced size, and the strong dependence on a few products. The ultimate goal was to improve competitiveness in these regions, exploring the natural advantages related to their locations, the rich marine biodiversity and good agricultural conditions. To this purpose, several different action plans have been developed, covering both the European outermost regions and the European countries: Adriatic and Ionian Seas Plan, Atlantic Ocean Plan, Artic Ocean Plan, Baltic Sea Plan, Black Sea Plan, Mediterranean Sea Plan and North Sea Plan (European Commission, 2016f):

1) The *Integrated Maritime Surveillance,* launched in 2008 by the European Commission, is a tool used in the compilation and spread of useful information from the different national and European authorities (i.e. control of fisheries), so that these activities become more efficient, saving time and money (European Commission, 2016e).
2) *Marine Knowledge 2020,* also created by the European Commission in 2010, serves the purpose of improving the available data of the maritime affairs and benefit from its more efficient use in order to create further knowledge. To do so, it joins national and European data systems on information about winds, sea currents or migrating species creating a global one which have a beneficial impact on, among many others, the environment and fisheries and allow better decisions in terms of the establishment of legislation and funding (European Commission, 2016c).
3) The *Blue Growth* initiative (raised in 2012 by the European Commission) aims to harness the full potential of the European seas and oceans. Being aware of the economic value of the traditional maritime sectors, such as Shipbuilding and Ship repair, Transports, Fisheries and Offshore oil and gas, this initiative points out the five highly potential sectors for a sustainable growth, which are, Biotechnology (i.e. medicines), Renewable energy (i.e. wind, waves), coastal and maritime tourism (i.e. cruise, yacht tourism), Aquaculture and Mineral resources. The *Blue Growth* also intends to promote the creation and transfer of knowledge and to reinforce the legislation for the sustainable exploration of the seas, improving cooperation among member states (European Commission, 2016a).

4) The *Maritime Security Strategy*, established by the European Council in 2014, was created to help each country's authorities developing their own policies and to identify and overcome the possible constraints for the pursuit of the European strategic maritime interest (European Commission, 2016b).
5) Finally, the *Maritime Spatial Planning*, created in 2014 by the European Parliament and the European Council, is basically a mechanism to make sure nations and stakeholders behave properly in what concerns the exploration of maritime resources. It basically set out some common requirements and each member state has a certain degree of freedom to plan the exploration of its maritime activities. The common requirements of the programme and which European countries share enable cooperation between them and avoid possible conflicts, may increase investment and protect the environment (European Commission, 2016d).

A synthesis of the European Policies on maritime affairs is provided in Table 6.

Table 6: European Policies on the Maritime Affairs

Designation	Year	Responsible Body	Main goals / components
Sea Basin Strategy	2007	European Commission	• Development of action plans for the European Union outermost regions in order to overcome the difficulties faced by those territories. Therefore, this policy concentrates in "improving accessibility, increasing competitiveness and strengthening regional integration"
Integrated Maritime Surveillance	2008	European Commission	• Develop mechanisms of exchanging data and important information on maritime surveillance to interested bodies, which will allow it to become more effective and cheaper.
Marine Knowledge 2020	2010	European Commission	• "Helping industry, public authorities and researchers find the data and make more effective use of them to develop new products and services. • Improving our understanding of how the seas behave."
Blue Growth	2012	European Commission	• "Develop sectors that have a high potential for sustainable jobs and growth; • Essential components to provide knowledge, legal certainty and security in the blue economy Sea basin strategies to ensure tailor-made measures and to foster cooperation between countries"
Maritime Security Strategy	2014	European Council	• "to identify and articulate the main strategic maritime interests of the EU; • to identify and articulate the maritime threats, challenges and risks to the strategic maritime interests of the EU; and • to organise the response, i.e. provide the common policy objectives, common principles and areas of common support as the backbone of the joint strategic framework in order to create coherence for the diverse and wide array of sector specific maritime policies and strategies."
Maritime Spatial Planning	2014	European Parliament European Council	• "Planning when and where human activities take place at sea", promoting efficiency and sustainability. The advantages from the planning are: • "✓ Reduce conflicts; ✓ Encourage investment; ✓ Increase coordination; ✓ Increase cross-border cooperation; ✓ Protect the environment"

Source: Own elaboration based on information of European Commission 2016a,b,c,d,e,f

The idea of social and economic growth based on the sustainable development and environmental protection, already present in the Treaty of Lisbon and in the *Lisbon Agenda*, was later reinforced in the *Europe 2020* Strategy, which emphasizes the need to promote *smart, sustainable and inclusive* growth (European Commission, 2016g).

Later, the *European Maritime and Fisheries Fund* (EMFF) has been created. This fund, which replaces EFF, supports the maritime policies for the period between 2014 and 2020. Its mission is to help firms moving sustainable fishing, help coastal areas becoming less dependent on marine activities, diversifying businesses, creating new jobs and improving quality of life and to simplify the application processes for the funding. EMFF is used together with national funds to support national projects and the total of the budget for the seven years is of about 6400 million euros (European Commission, 2016k)

The fund is distributed according to each country's maritime industry size. Each member state creates an Operational Programme, in which presents the ideas and initiatives to spend the fund with, which is later approved by the European Commission and then it is of responsibility of the national authorities to select the projects that will receive this financial aid. The five European countries that are allocated with the largest shares are, in order of importance, Spain, France, Italy, Poland and Portugal (European Commission, 2016k).

Around 89% of the fund is managed by the member states, for instance on the investment of the protection of the marine environment from the negative impact of fishing, the implementation of more innovative techniques to foster sustainability and better data collection and on the exploration of new and sustainable marine resources. Thereby, €4340 million are allocated to Sustainable Fisheries; €580 million to Control and Enforcement; €520 million to Data Collection and €71 million to the Blue Economy (European Commission k, 2016). The remaining 11% are managed by the European Commission and invested in International Governance, Cooperation, Marine Knowledge and Maritime Spatial Planning (European Commission k, 2016).

3.2. The Portuguese agenda

The Portuguese connection with the sea is undeniably strong and it represents an extremely important element of the Portuguese history. This relation is mainly due to the geographic position of the territory. It was the sea that attracted the Phoenicians and how Romans and Arabs came to Portugal. Besides, the sea allowed Portugal to break the isolation and mitigate

the peripheral condition of the country. Despite this, this relation has not been stable over time as there were some periods of a relative distancing, especially after the decolonisation period and the end of the *Estado Novo*. This political change determined a rupture with the former social and economic order that was very linked with the traditional sectors such as fisheries and agriculture (Pitta e Cunha, 2011). The subsequent movement of European integration played a significant role in strengthening the link with the sea, due to the central attention given to policies and initiatives, being nowadays set as a priority domain of action.

As a member state of the European Union since 1986, Portugal is under the regulations of the European institutions, also in what concerns the Fisheries and the other maritime sectors.

The Portuguese entry in the European Economic Community had a strong impact on agriculture and fisheries, since these sectors had been relatively protected from international competition, experiencing relatively low economic and social growth rates. Some European requirements had particular impact on the Fisheries sector: the external sourcing and the fleet decrease. Portugal had, in fact, a good performance reducing the number of vessels and ships, from 18.500 in 1986 to 9000 in 2006, which had to do with the concerns about the sustainability on the resource exploration. The external sourcing happens under international agreements, in which the European countries are allowed to explore other countries' maritime resources, mainly in African countries (Cunha, 2010).

So far, in Portugal, the implementation of the European regulations on the fisheries and the general exploration of the maritime resources was a way to walk off from obsolete infrastructures and sectors, by turning it into more modern, innovative and competitive ones (Cunha, 2010).

In Portugal, as well as in every member state of the European Union, the Maritime policy is applied under general investment and structural funds, and *Direção-Geral de Política do Mar*, responsible for the development of the national strategy of the maritime activities, presents the European financial supports: *Horizon 2020, Life* and *COSME* (DGPM, 2016). *LIFE,* which exists since 1992, is a financial aid created to support environmental protection and climate actions and has a budget of €3.4 billion for the period 2014-2020 (European Commission, 2016l). *COSME* is a funding programme for the *Competitiveness of Enterprises and SMEs* and, with a total budget of €2.3 billion, helps small and medium enterprises getting easier access to funding opportunities, accessing new markets both within the European Union and outside, guiding and mentoring entrepreneurs and developing business conditions by adopting innovative models of businesses (European Commission, 2016m). Finally, Horizon 2020 is

the major European programme regarding research and innovation and, with €80 billion for 2014-2020, aims to promote *smart, sustainable and inclusive* economic growth through job creation and innovation and competitiveness stimulation (European Commission, 2016n).

The operationalization of the strategy and funding for the development of the maritime activities was part of the COMPETE programme, which was under the management of QREN, *Quadro de Referência Estratégico Nacional*. COMPETE (*Programa Operacional de Factores de Competitividade)* played an important role in the evolution of the maritime sectors, as it was the major driver of the creation and expansion of the *Cluster do Conhecimento e da Economia do Mar* (COMPETE, 2016).

This cluster appeared under the action of *Oceano XXI – Associação para o Conhecimento e Economia do Mar*, which, through the merger with *Fórum Empresarial da Economia do Mar*, was transformed into the *Fórum Oceano – Associação da Economia do Mar*. This association operate under five strategic routes: entrepreneurship and business development, innovation, knowledge and technologies applied to the maritime context, internationalization and strategic information and monitoring (Fórum Oceano, 2016). The cluster was created in 2009 and its key purpose was to boost research and investment, preserve and promote maritime activities by adding new technologies and turning them into more competitive, innovative and efficient ones. The objectives, presented in Table 7, are generally speaking, linked to the promotion of entrepreneurship, innovation, cooperation and employment (COMPETE, 2016).

The cluster is composed of several different activities related to the exploration of the sea, divided in distinct areas: traditional, complementary and emergent. Within the first set of activities, it is Fisheries and Aquaculture, Processing of fishing products, Extraction of sea salt, Maritime transports, Ship building, Port operations and Nautical Tourism. The complementary activities are composed by Maritime defence and security, Maritime culture and services. Finally, the emergent activities of the cluster are Marine bio-resources and biotechnology, Technological R&D and Offshore energy (Fórum Oceano, 2016). As a cluster, it is constituted by many diverse members, from companies, business associations, Higher education institutes to regional entities, R&D centres, banking institutions and consulting organizations, which makes it very dynamic (COMPETE, 2016).

Oceano XXI association is part of the European project *Resource Efficient Maritime Capacity* (REMC), which gathers entities from six different European maritime clusters from England, France, Ireland, Lithuania, Portugal and Sweden. REMC aims to help sectors as offshore energy, fishery and aquaculture, maritime biotechnology growing and getting more innovative

based on the efficient exploration of the maritime resources (Fórum Oceano, 2016). Despite the participation of foreign universities and institutes, Oceano XXI is the only Portuguese entity associated to REMC.

Table 7: Main objectives of *Cluster do Conhecimento e da Economia do Mar*

Reinforce the scientific and technological capabilities of firms and entities operating in the maritime areas
Support the constitution of consortium agreements between R&D centres and companies in order to facilitate the knowledge and technology sharing
Develop cooperation networks between companies in order to increase business efficiency and to improve the access to international markets
Promote entrepreneurship related to products development and services diversification
Stimulate innovation and technological development of the marine industries and the activities related to the value chain and the renewal of business models and pattern of specialization
Develop the required skills for the qualification of the activities that are part of the maritime economy and the reinforcement of employability
Improve intersectoral coordination and strengthen cooperation between public and private agents
Promote the development of cultural, tangible and intangible heritage, on the maritime context

Source: COMPETE (2016)

Whereas in the past the exploration of the maritime activities was within the scope of COMPETE and QREN, nowadays it constitutes an independent Operational Programme, *Mar* 2020, successor of PROMAR, which, co-financed by the *European Maritime and Fisheries Fund (EMFF)*, aims to implement the EMFF supporting actions and establish the priority areas of intervention along with the goals of *Europe 2020* strategy (Table 8) (MAR 2020, 2016).

Table 8: Mar 2020 strategic priorities

Promote competitiveness based on knowledge and innovation
Ensure environmental, social and economic sustainability of fisheries and aquaculture sectors, contribute to the maritime environmental conservation and promote the Integrated Maritime Policy
Contribute to the development of coastal areas, foster employment and territorial cohesion as well as increase the capabilities of professionals

Source: Mar 2020 (2016)

The total budget for this operational programme is of over €507 million, from which more than 77% came from European funding, more precisely from EMFF. Mar 2020 also stands out due to the fact that it now includes some priority areas that were, in the past, assigned to the European Commission, such as the maritime surveillance and data collection, and also the integrated maritime policy whose management is now shared between the European Commission and Portugal (MAR 2020, 2016).

Apart from this, several other national and European funding opportunities are available and in force in Portugal (see Table 9). From credit lines with low interest rates, European structural funds and more specific funding programmes, the Portuguese entities associated to the maritime activities have distinct supporting mechanisms to take advantage from. The increasing Portuguese political interest on the activities related to the exploration of the sea and its potential had one of the most important materialization with the creation of the *Ministério do Mar* in 2016, which manages the European political initiatives and funds, as well as develops national actions on the scope.

Although *Mar 2020* has very specific strategic goals and actions, some of its key actions have always been present in former European and national programmes, as indicated earlier, such as: competitiveness, sustainability, employment, qualification and investment. In the following chapter an attempt is made to see if the increasing relevance of the sea on political matters was reflected into significant changes in the sea cluster.

Table 9: Financial support currently available for Portuguese companies and entities

Designation/Scope	Year	Origin	Responsible	Legislation
INTERREG Atlantic Area 2014-2020	2014 2020	European programme	Managing Authority of INTERREG Atlantic Area programme.	• Regulation (EU) No 1299/2013 • Regulation (EU) No 1303/2013 • Regulation (EU) No 1301/2013
Low-interests credit line addressed to the fishing sector companies in mainland Portugal	2014 ----	National programme	IFAP - Instituto de Financiamento da Agricultura e Pescas	• Decree-Law No 116/2014
Joint programming initiative "Healthy and Productive Seas and Oceans"	2014 2020	European programme	European Union, European Comission, Direcção-Geral da Investigação e da Inovação	• Commission Recommendation No 2011/C 276/01
Food security, sustainable agiculture and foresty, maritime and inland waters research and the Bioeconomy: 3rd priority – Societal Challenges – Horizon 2020	2014 2020	European programme	European Union, European Comission, Direcção-Geral da Investigação e da Inovação	• Regulation (EU) No 1291/2013 that creates Horizon 2020
EMFF: European Maritime and Fisheries Fund 2014-2020	2014 2020	European Fund		• Regulation No 508/2014 • Commission Implementing Regulation No 288/2014 • Commission Implenting Regulation No 480/2014 • Commission Implenting Regulation No 771/2014 • Commission Implenting Regulation No 772/2014
Support System to investments on the scope of the development of new markets and promotion campaigns	2008 ----	National programme	*Ministério da Agricultura, do Desenvolvimento Rural e das Pescas*	• Portaria nº 719-B/2008 • Portaria nº 226/2012
Credit line to finance entities from fisheries sectors	2006	National programme	*Ministério da Agricultura, do Desenvolvimento Rural e das Pescas*	• Decree-Law No 179/2006 • Regulation (EC) No 1860/2004 Comission 6 October 2004 about the implementation of Articles 87 and 88 from Treaty EC to support agriculture and fisheries sectors
Fundo de Compensação Salarial dos Profissionais da Pesca	1999 2015	National Fund	*Ministério da Agricultura, do Desenvolvimento Rural e das Pescas*	• Decree-Law No 311/99 • Decree-Law No 61/2014

Source: EUROCID (2016

4. The Portuguese maritime cluster: an overview

As indicated earlier, there is no single view of the composition of the "Blue Economy". Some studies adopt a restrict approach, mainly focusing on the ship industry (Benito et al., 2003), whereas others include many other areas of activity, such as fisheries, ports and maritime transports (Salvador, 2013).

In this study we consider the maritime cluster as being composed of three main areas: *Fisheries and related activities*, *Shipbuilding and ship repair* and *Maritime transports*, as in Banco de Portugal (2015), including the CAE Rev. 3 industries described in Table 10.

Table 10: Economic activities included in the Maritime Sector

	CAE Rev. 3	Description
Fisheries and related activities	**0311**	Marine Fishing, algae and other sea products harvesting
	03111	Marine Fishing
	03112	Algae and other sea products harvesting
	0321	Marine Aquaculture
	08931	Extraction of Sea Salt
	1020	Processing and preserving of fish, crustaceans and mollusks
	10201	Preparation of marine and aquaculture products
	10202	Freeze of marine and aquaculture products
	10203	Preserving of marine and aquaculture products in olive oil and other vegetable oils
	10204	Salting, drying and other activities of transformation of marine and aquaculture products
	46381	Wholesale of fish, crustaceans and mollusks
	4723	Retail sale of fish, crustaceans and mollusks in specialized stores
Shipbuilding and Ship Repair	**301**	Building of ships and boats
	3011	Building of ships and floating structures
	3012	Building of pleasure and sporting boats
	3315	Repair and maintenance of ships and boats
Maritime Transports	**5010**	Sea and coastal passenger water transport
	50101	Non-coastal passenger maritime transport
	50102	Coastal and local passenger maritime transport
	5020	Sea and coastal freight water transport
	5222	Service activities incidental to water transportation
	7734	Rental and Leasing of maritime and inland transports
	93292	Recreational Harbours activities (marinas)

During the 2000-2014 period, Fisheries and related activities remained the most important sea activities in Portugal, accounting for more than 90% of the total of the companies in

the Maritime Sector. However, Fisheries and related activities is the group which has been actually losing more companies throughout the years. In the case of Shipbuilding and Ship repair, in spite of the substantial downturn in the number of companies from 2009 until 2012, there have been some signs of recovery during the last years. Finally, the group of Maritime Transports is the only one in which the number of companies has been increasing over time, from 263 in 2004 to 359 in 2014, with an average growth rate of 3% per year (Figure 3).

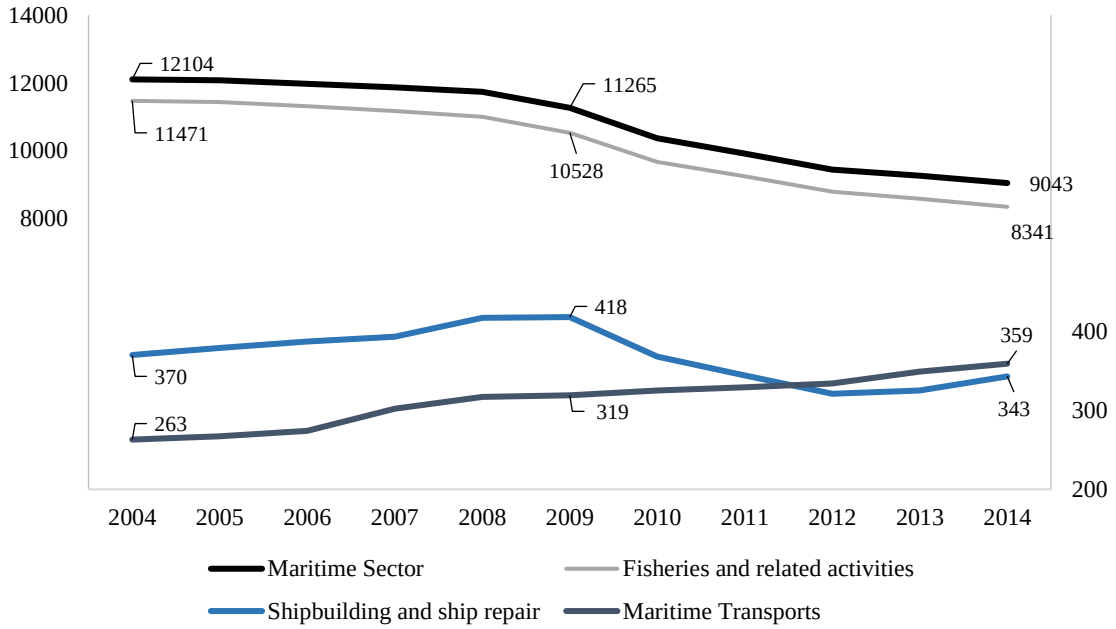

Figure 3: Evolution by year of the number of companies of the Maritime Sector and of its main groups

Source: Portuguese Statistical Office

Taking into account the size of firms, it can be seen furthermore that micro firms represent the vast majority in fisheries, whilst the number of large enterprises is minimal (about 0.1% of the total) (Table 11). Also, in the case of Shipbuilding and Ship Repair and Maritime Transports, the companies with less than 10 employees assume a major importance, as over 80% of the companies from these two groups were of this type. However, in both cases the importance of the small and medium-sized companies is substantially bigger than in the Fisheries and related activities and also the large firms have greater importance.

Table 61: Number of firms by class size, in percent (2004-2014)

Years	Fisheries and related activities				Shipbuilding and Ship Repair				Maritime Transports			
	Number of employees				Number of employees				Number of employees			
	< 10	10 to 49	50 to 249	> 250	< 10	10 to 49	50 to 249	> 250	< 10	10 to 49	50 to 249	> 250
2004	95.4	4.1	0.5	0	81.9	15.1	2.2	0.8	80.2	12.9	6.5	0.4
2005	95.3	4.2	0.5	0	80.5	15.8	2.9	0.8	80.5	12.7	6.4	0.4
2006	95.1	4.4	0.5	0	80.1	16.3	2.3	1.3	81.0	11.7	6.6	0.7
2007	95.2	4.3	0.5	0	80.9	15.5	2.3	1.3	81.5	12.3	5.6	0.6
2008	95.0	4.5	0.5	0	82.0	13.9	3.1	1.0	82.3	11.7	5.7	0.3
2009	95.3	4.2	0.5	0	81.8	14.4	3.1	0.7	81.2	12.9	5.6	0.3
2010	94.8	4.7	0.5	0	83.2	14.1	2.4	0.3	83.4	11.4	4.9	0.3
2011	94.6	4.7	0.6	0.1	84.3	13.1	2.3	0.3	83.0	12.5	4.0	0.5
2013	94.9	4.4	0.6	0.1	83.2	14.6	1.9	0.3	82.6	12.9	3.9	0.6
2013	94.7	4.7	0.6	0.0	83.1	13.5	3.1	0.3	83.1	12.3	4.0	0.6
2014	94.6	4.7	0.6	0.1	84.5	11.4	3.5	0.6	83.8	11.4	4.2	0.6

Source: Portuguese Statistical Office

Considering the Maritime Sector as a whole, micro firms have been, by far, the most important ones, assuming an extremely high proportion of the total of companies (above 90% every year). Small firms have a relatively small importance (about 5%), whereas medium and large sized firms represent a very low fraction.

Regarding the location of firms, strong geographical concentration exists. In 2014, the major location was the Lisbon Metropolitan Area, with 22.7% of the total of the companies of the Maritime Sector, followed by Centre region, with 21.6%, North region, 21.1% and Algarve, 20.4%. Two other regions have a relatively weak importance: the Autonomous Region of Madeira and Alentejo, which hosted back in 2014, respectively, only 1.7% and 4.6% of the total of the companies of these sectors (Table 12).

Taking into account the three major areas of the maritime cluster it can be seen furthermore that in 2014 most companies in Fisheries and related activities were located in the Centre, especially in *Oeste* and *Aveiro*.[4]

[4] The analysis is made based on *Nomenclatura das Unidades Territoriais* (NUTS) III. In the period under analysis there was a change in the NUTS classification, from NUTS 2002 to NUTS 2013. NUTS 2002 divides the Portuguese territory into 41 sections, whereas NUTS 2013 divides the territory in 36 sections. A comparative analysis of the number of companies in each geographical section using both classifications is presented in the Annex (Tables A.1- A.3).

Table 72: Location of firms of the Maritime Sector in the Portuguese territory

Region	No. of companies	%
Portugal	9043	100%
North	1908	21.1%
Centre	1950	21.6%
Lisbon Metropolitan Area	2055	22.7%
Alentejo	414	4.6%
Algarve	1846	20.4%
Autonomous Region of the Azores	716	7.9%
Autonomous Region of Madeira	154	1.7%

Source: Portuguese Statistical Office

Regarding Shipbuilding and Ship Repair, the regions of Lisbon and Algarve were most prominent, particularly the region of *Península de Setúbal*, which accounted for 25% of firms in 2009 (32% in 2004). In 2014, the Lisbon Metropolitan Area was the most important location for these firms, hosting about 40% of the total, being followed by the North and Algarve, and lastly by the Centre region. Finally, the companies of the Maritime Transports sectors are mostly located in Lisbon, Lisbon Metropolitan Area and in Algarve. The region of Lisbon hosted, in 2004, 2009 and 2014 over 30% of the total of companies of this sectors. The region of Algarve hosted, during the same years, about one quarter of the total of the firms. The remaining companies were heterogeneously spread over the rest of the Portuguese territory (see Table A.3).

Taking into account the latest available data, regarding 2014, one can have a more detailed view on the sectoral composition of activities in each region. These are strongly concentrated within the Portuguese territory: and most particularly in the regions of Porto, West, Aveiro, Coimbra, Lisbon, Algarve and Azores (Figure 4). Firms of sector 0311 - Marine Fishing, algae and other sea products harvesting were mainly located in Algarve (25.5%), in Lisbon Metropolitan Area (17.1%) and in the Autonomous Region of the Azores (15.3%). Over 65% of the total of the companies of the sector 0321 - Marine Aquaculture were located in Algarve, which assumed a huge importance in this activity, as well as in the sector of 08931 – Extraction of salt, once over 36% of the total of the companies were located there. Still in this sector, it is undeniable the importance of Coimbra, once almost half of the Portuguese companies were located there (Table 13).

Table 83: Firms of the Maritime Sector, according to location (%) (2004-2014)

	Maritime Sector		Fisheries and related activities		Shipbuilding and Ship Repair		Maritime Transports	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
				2004				
North	2765	22.8	2687	97.2	54	2.0	24	0.9
Centre	2548	21.1	2473	97.1	55	2.2	20	0.8
Lisbon	2876	23.8	2631	91.5	163	5.7	82	2.9
Algarve	2259	18.7	2140	94.7	55	2.4	64	2.8
				2009				
North	2503	22.2	2413	96.4	60	2.4	30	1.2
Centre	2336	20.7	2253	96.4	59	2.5	24	1.0
Lisbon	2715	24.1	2445	90.1	164	6.0	106	3.9
Algarve	2167	19.2	2003	92.4	75	3.5	89	4.1
				2014				
North	1908	21.1	1817	95.2	64	3.4	27	1.4
Centre	1950	21.6	1854	95.1	52	2.7	44	2.3
Lisbon	2055	22.7	1803	87.7	128	6.2	124	6.0
Algarve	1846	20.4	1683	91.2	62	3.4	101	5.5

Source: Portuguese Statistical Office

The companies of sector 1020 - Processing and preserving of fish, crustaceans and mollusks were geographically spread, but both the Metropolitan Areas of Porto and Lisbon and the regions of Aveiro and West, in the Centre, hosted together almost 60% of the companies. In what concerns the sector 46381 - Wholesale of fish, crustaceans and mollusks, the most important locations were Lisbon Metropolitan Area and Porto Metropolitan Area, with 28.4% and 27.8% of the total of the companies respectively. Finally, the sector 4723 - Retail sale of fish, crustaceans and mollusks in specialized stores had most of its companies located on the Metropolitan Areas as well, followed by Algarve, where over 11% of the companies were located. Jointly considering the whole activities that belong to the group of fisheries and related activities, companies were in

2014, mainly concentrated in Porto and Lisbon Metropolitan Areas, Aveiro, Coimbra, West, Algarve and Azores (Figure 5).

The group of Shipbuilding and Ship Repair is composed by both the sectors of Building of ships and boats (301) and Repair and maintenance of ships and boats (3315) and in both cases Lisbon Metropolitan Area assumed special relevance as over 30% of the correspondent companies were located there. Also Algarve and Porto Metropolitan Area aggregated many of these companies, being an important location of the companies of this group as well (Table 14 and Figure 6).

With regard to maritime transports, the data show that for all the studied sectors - Sea and coastal passenger water transport (5010), Sea and coastal freight water transport (5020), Service activities incidental to water transportation (5222), Rental and Leasing of maritime and inland transports (7734) and Recreational Harbours activities (marinas) (93292) – the most important locations of the companies were Algarve and Lisbon Metropolitan Area, except for the sector of Sea and coastal freight water transport (5020), which had none company located in Algarve. The geographical distribution of the companies of maritime transports group is presented on Figure 7.

Table 94: Firms' location, according to the sector of activity (2014)

	Fisheries and related activities						**Shipbuilding and Ship Repair**		**Maritime Transports**				
Sectors (CAE Rev.3)	**0311.**	**0321.**	**8931.**	**1020.**	**46381.**	**4723.**	**301.**	**3315.**	**5010.**	**5020.**	**5222.**	**7734.**	**93292.**
Areas/Total	3689	385	55	153	820	3239	132	211	147	56	88	59	9
Porto Metropolitan Area	8.9%	--	--	18.3%	17.8%	15.6%	9%	11%	--	14.3	10.2%	--	--
Alto Minho	--	--	--	--	--	--	10%	--	--	--	--	--	--
West	9.5%	--	--	13.1%	10.0%	5.5%	5%	5%	10.2%	--	--	--	--
Aveiro	8.4%	9.1%	--	14.4%	7.2%	--	11%	--	--	5.4%	--	6.8%	--
Coimbra	--	--	49.1%	--	--	--	--	--	--	--	--	--	--
Lisbon Metropolitan Area	17.1%	14.8%	7.3%	13.7%	28.4%	26.5%	33%	40%	23.1%	35.7%	56.8%	28.8%	33.3%
Algarve	25.5%	65.7%	36.4%	5.9%	11.7%	11.3%	10%	23%	37.4%	--	12.5%	52.5%	44.4%
Azores	15.3%	--	--	--	--	--	11%	5%	13.6%	10.7%	--	--	--
Madeira	--	--	--	--	--	--	--	--	10.2%	14.3%	--	--	--

Source: Portuguese Statistical Office

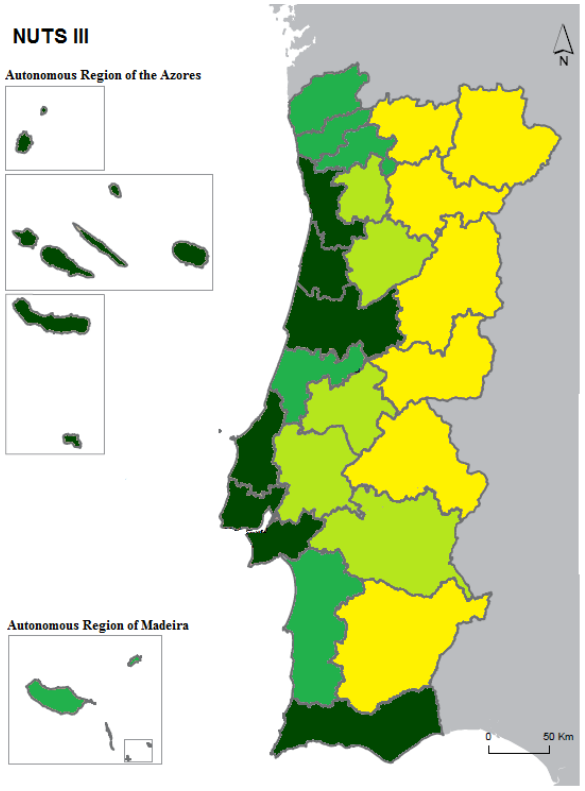

Figure 4: Firms of the Maritime Sector NUTS 3, 2014

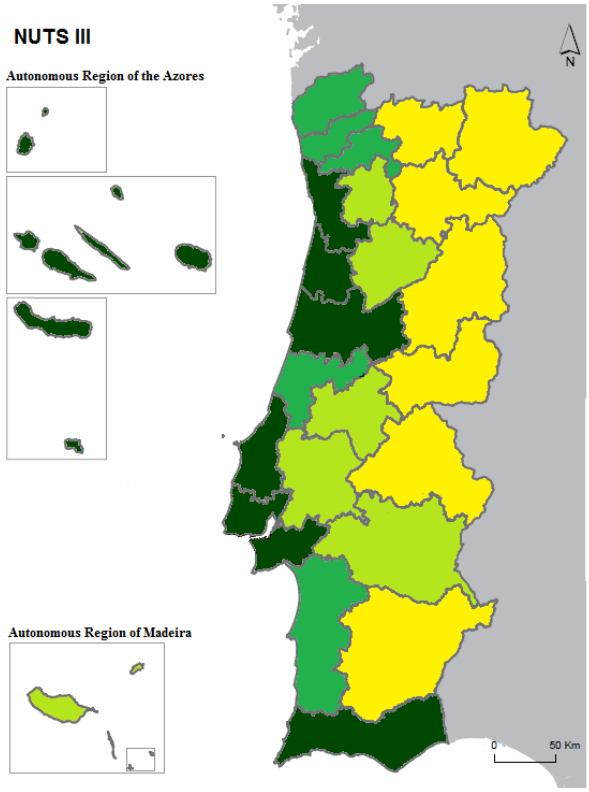

Figure 5: Firms of Fisheries and related activities NUTS 3, 2014

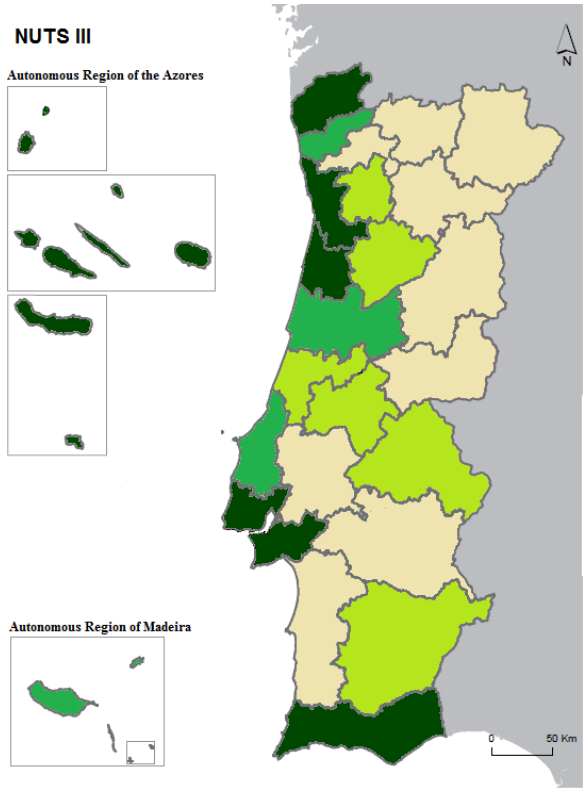

Figure 6: Firms of Shipbuilding and Ship repair NUTS 3, 2014

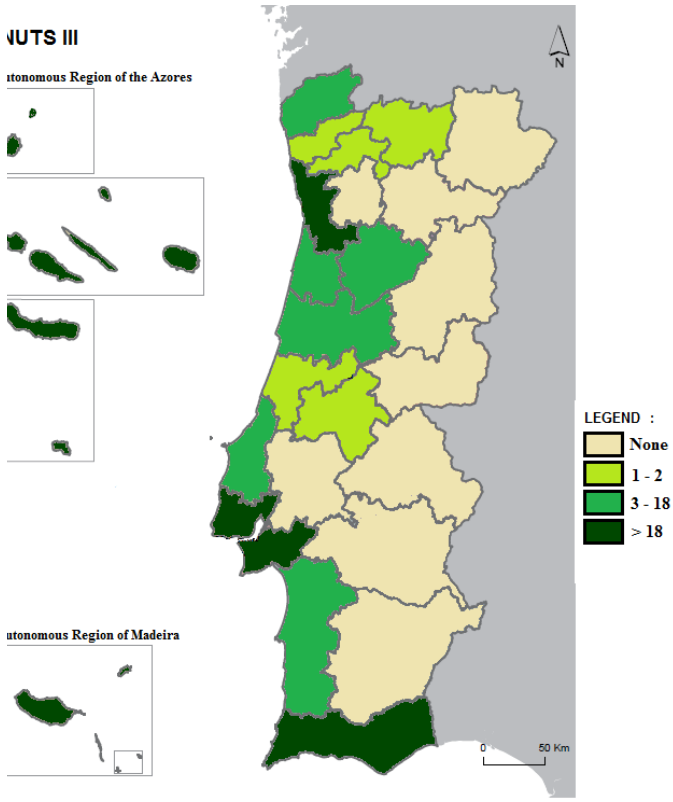

Figure 7: Firms of Maritime Transports NUTS 3, 2014

In addition to these locations, Porto Metropolitan Area assumed also a relevant position in the "Sea and coastal freight water transport" (5020) and "Service activities incidental to water transportation" (5222), hosting, respectively, 14.3% and 10.2% of the total of the companies of each sector. Also both the Autonomous Regions were of considerable importance in the location of the companies from the Sea and coastal passenger water transport (5010) and Sea and coastal freight water transport (5020) (Table 14).

Taken the economic activities related to the sea as a whole, the most important regions were the Lisbon and Porto Metropolitan Areas and Algarve followed by some less important regions, such as West and Aveiro, in the Centre. In some exceptional cases firms are concentrated in other regions, such as in the Extraction of salt (08931) in Coimbra or the case of Alto Minho, which concentrates 10% of the total of the companies from the sector of Building of Ships and Boats (301), due to the location of "Estaleiros de Viana".

4.1. Employment

Along with the decrease in the number of companies of the Maritime Sector, there was also a decline in employment. Fisheries and related activities are of major importance, employing over 77% of the total of the workers of the Maritime Sector in 2014. Shipbuilding and Ship Repair diminished their importance during the period under analysis, whereas Maritime Transports maintained its share (see Table 15).

Fisheries and Related activities have shown an overall tendency of decline, which however has been stabilized after 2012 (Figure 3). Shipbuilding and Ship Repair experienced a significant decline (from 5709 workers in 2004 to 2882 in 2014), whereas the evolution of Maritime Transports shown relative constancy (Figure 8).

Table 15: Employment in the Maritime Sector (2004-2014)

	2004		2009		2014	
Main groups	**Personnel employed**	**%**	**Personnel employed**	**%**	**Personnel employed**	**%**
Fisheries and related activities	21531	70.3	21167	70.4	20090	77.3
Shipbuilding and Ship Repair	5709	18.6	5167	17.2	2882	11.1
Maritime Transports	3413	11.1	3734	12.4	3015	11.6
TOTAL	**30653**		**30068**		**25987**	

Source: Portuguese Statistical Office

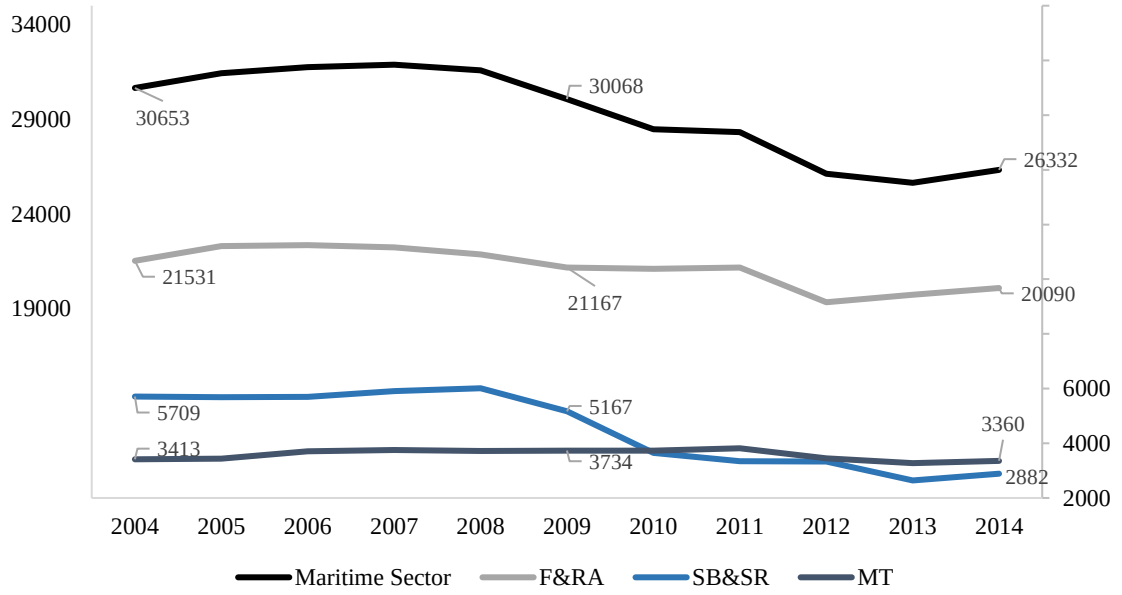

Figure 8: Evolution by year of the number of personnel employed on the Maritime Sector and on its main groups

Source: Portuguese Statistical Office

4.2. Turnover, Gross Value Added and Investment

The activities that belong to the maritime cluster had a turnover of over 6 billion euros in 2014, from which over 75% were obtained by the sectors of fisheries and related activities. Despite the fact that the companies of sectors of maritime transports represented, in 2014, only 4% of the total, and that these activities were responsible for only 11.6% of the total of the employees of the maritime sector, those were actually responsible for 18.2% of the total of the turnover from the activities of the maritime sector (Table 16). Globally, however, there was a decline in the value of turnover during the period under study.

Table 16: Turnover of the Maritime Sector (2004-2014)

	Maritime Sector	**Fisheries and Related activities**		**Shipbulding and Ship Repair**		**Maritime Transports**	
Years	**Turnover €**	**Turnover €**	**% of the total**	**Turnover €**	**% of the total**	**Turnover €**	**% of the total**
2004	3 598 107 341	2 660 556 636	73.9	314 743 423	8.7	622 807 282	17.3
2005	3 772 357 311	2 772 401 269	73.5	350 444 208	9.3	649 511 834	17.2
2006	4 013 850 800	2 937 659 078	73.2	390 207 222	9.7	685 984 500	17.1
2007	4 248 119 944	3 027 144 016	71.3	451 809 357	10.6	769 166 571	18.1
2008	4 295 282 009	2 991 221 365	69.6	547 195 356	12.7	756 865 288	17.6
2009	3 595 227 979	2 592 525 331	72.1	370 572 825	10.3	632 129 823 **(*)**	17.6
2010	3 646 448 187	2 767 626 630	75.9	241 698 830	6.6	637 122 727 **(*)**	17.5
2011	3 700 092 727	2 858 630 575 **(*)**	77.3	199 307 085	5.4	642 155 067 **(*)**	17.4
2012	3 804 981 819	2 952 626 873 **(*)**	77.6	205 127 790	5.4	647 227 156 **(*)**	17.0
2013	3 577 553 631	2 700 818 412	75.5	224 395 912	6.3	652 339 307 **(*)**	18.2
2014	3 608 044 912	2 726 497 706	75.6	224 055 370	6.2	657 491 836 **(*)**	18.2

(*) estimated value [5]

Source: Portuguese Statistical Office

The evolution of the gross value added of the activities that belong to the maritime cluster is depicted in Figure 9.[6] Once again there was an overall negative evolution

[5] Values estimated through the application of the average growth rate of all the other considered years
[6] The full data is presented in Table A.10 in the Annex.

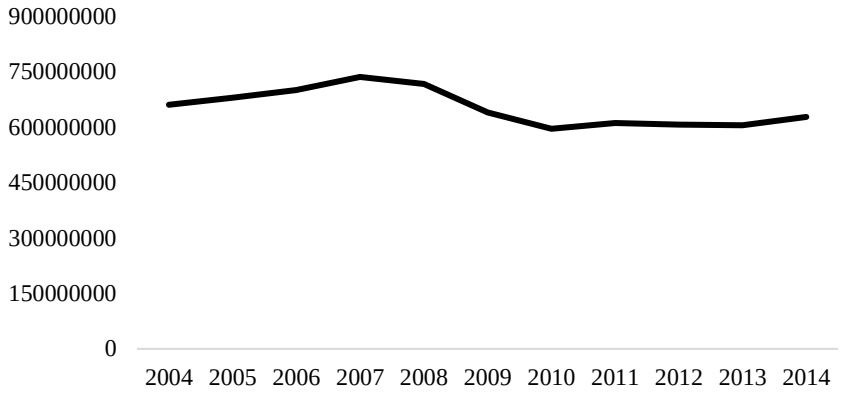

Figure 9: Evolution of the Gross Value Added of the companies of the Maritime Sector in 2000 constant prices (€)

Source: Portuguese Statistical Office

Fisheries and related activities accounted for most of GVA, experiencing a global tendency of decline. Ship building and ship repair activities experienced a marked decrease, whereas, in the case of maritime transports a growth tendency has been in place since 2009 (Figure 9).

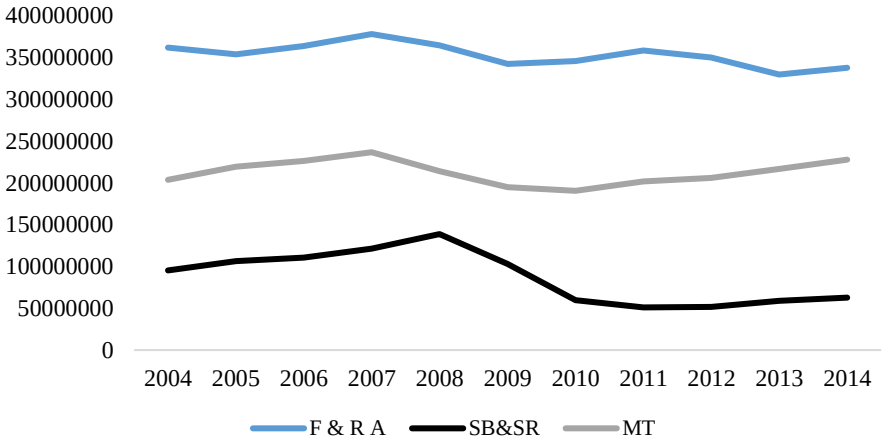

Figure 10: Gross Value Added of the companies in 2000 constant prices (€)

Source: Portuguese Statistical Office

Regarding GFCF, there has been also a tendency of decline, although an erratic one. Between 2004 and 2014 it suffered a reduction of about one third (see Figure 11).

Figure 11: Evolution of the Gross Fixed Capital Formation from the Maritime Sector in 2000 constant prices (€)

Source: Portuguese Statistical Office

The same tendency of decline is found in all the main activities of the cluster (Figure 12). Full data is presented on Table A.11 (annex).

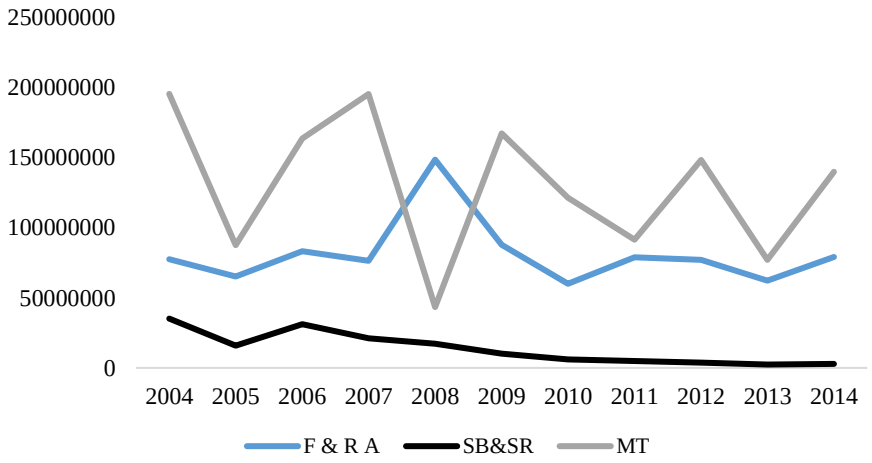

Figure 12: Gross Fixed Capital Formation - in constant 2000 prices (€)

Source: Portuguese Statistical Office

For both the indicator of gross value added of the companies and gross fixed capital formation (later considered) data was get in the Portuguese Statistical Office website. The missing data was estimated through the determination of the average rate of economic growth. As both of the indicators were measured on euro at current prices the analysis might get distorted results due to the instability of prices and inflation so it was used the GDP annual implicit deflator change rate for the calculation of the gross value added and the gross fixed capital formation annual implicit deflator change rate for the same indicator. The year 2000 was selected and the prices of this year were used to calculate the implicit deflator of the analysed years and then this value was applied in the period in analysis. The values in current prices and its transformation into 2000 constant prices are exposed in Annex (Table A.4, A.5 and A.6 for Gross Value Added and Table A.7, A.8 and A.9 for Gross Fixed Capital Formation).

The evolution in investment in Fish and Related Activities reflects to some extent the internal adoption of the European policies regarding fisheries. One of the major and controversial measures had to do with the reduction on the number of vessels in order to diminish the capacity of exploration and avoid resources overexploitation. The European Commission intended that part of the reduction was replaced by new, smaller and modern vessels, with higher level of technology incorporated. However, as can be seen in Table 17, the number of vessels experienced a sustained decline, and small vessels (with less than 5 Gross Tonnage) have increased their (already extremely large) share.

Table 17: Number of Portuguese vessels in 2004, 2009 and 2014

	2004	**2009**	**2014**
No. of vessels	10089	8562	8177
From which small	87%	85%	90%

Source: Portuguese Statistical Office

In 2004, small vessels represented 87% of the total, whereas large vessels represented only 2.5%. In the same year, 385 vessels were eliminated from the Portuguese fishery fleet, from which 293 were destroyed. On the other hand, 293 vessels were added to the same fleet, from which 217 were brand new.

In 2009, the national fleet was composed by 8562 vessels, from which 85% were small. A total of 147 vessels, from which 117 destroyed, left the account of the fleet, whereas 111 entries were registered, 89 new constructions.

Finally, in 2014, the number of registered vessels was of 8177, 90% of which were small, with less than 5 GT and 6.3% were big ones. In this year, 81 vessels eliminated from the fleet, from which over 65% were demolished. On the contrary, 44 new registration were made and 30 of these were new constructions.

It is clear the impact that the Common Fisheries Policy, among other European initiatives, had a particular impact in this indicator. Nevertheless, it is debatable the efficacy of this measure. If, on the one hand, the main goal of reducing the fleet capacity is being achieved, on the other, the second objective of turning the fleet into a more modern and technological one has been delivering dubious results, as the growth on the new entries over the years should have been higher.

In a nutshell, there has been a clear and general declining trend on the overall of the considered indicators, which reveals serious structural problems in the sector that is not taking advantage of the potentials of wealth creation through the exploration of the oceans.

4.3. The competitiveness of the Portuguese maritime cluster

Following the description of the main trends observed in the Portuguese maritime cluster domestically, an analysis is now undertaken of its competitiveness between 2004 and 2014. This is done based on the evolution of a number of indicators, such as exports, market shares, unit values and patents, and its comparison with other European maritime sectors in order to assess the recent trajectory of the cluster.

Since the UN COMTRADE data are based on product classifications (rather than sectoral ones) a selection was made of the products that matched best the sectors analysed in the previous chapter. To this purpose, we selected the products belonging to the three major areas of the maritime cluster: fisheries and related activities, shipbuilding and ship repair. As the group of maritime transports is constituted by services, an attempt was made to select the services that would fit in this scope. Table 18 below presents the selected products and services and its allocation to the major cluster groups.

Table 18: Products included in the analysis and its correspondence to the major cluster groups

CODE	NAME	MAIN GROUP
03	Fish and crustaceans. mollusks and other aquatic invertebrates	Fisheries & related actitivies
0301	Live fish	Fisheries & related actitivies
0302	Fish. fresh or chilled. excluding fish fillets and other fish meat of heading 03.04	Fisheries & related actitivies
0303	Fish. frozen. excluding fish fillets and other fish meat of heading03.04	Fisheries & related actitivies
0304	Fish fillets and other fish meat (whether or not minced). fresh. chilled or frozen	Fisheries & related actitivies
0305	Fish. dried. salted or in brine; smoked fish. whether or not cooked before or during the smoking process; flours. meals and pellets of fish. fit for human consumption	Fisheries & related actitivies
0306	Crustaceans. whether in shell or not. live. fresh. chilled. frozen. dried. salted or in brine; smoked crustaceans. whether in shell or not. whether or not cooked before or during the smoking process; crustaceans. in shell. cooked by steaming or by boiling in water. whether or not chilled. frozen. dried. salted or in brine; flours. meals and pellets of crustaceans. fit for human consumption	Fisheries & related actitivies
0307	Mollusks. whether in shell or not. live. fresh. chilled. frozen. dried. salted or in brine; smoked mollusks. whether in shell or not. whether or not cooked before or during the smoking process; flours. meals and pellets of mollusks. fit for human consumption	Fisheries & related actitivies
0308	Aquatic invertebrates other than crustaceans and mollusks. live. fresh. chilled. frozen. dried. salted or in brine; smoked aquatic invertebrates other than crustaceans and mollusks. whether or not cooked before or during the smoking process; flours. meals and pellets of aquatic invertebrates other than crustaceans and mollusks. fit for human consumption	Fisheries & related actitivies
1604	Prepared or preserved fish; caviar and caviar substitutes prepared from fish eggs.	Fisheries & related actitivies
1605	Crustaceans. mollusks and other aquatic invertebrates. prepared or preserved.	Fisheries & related actitivies
89	Ships. boats and floating structures	Shipbuilding & Ship Repair
8901	Cruise ships. excursion boats. ferry-boats. cargo ships. barges and similar vessels for the transport of persons or goods	Shipbuilding & Ship Repair
8902	Fishing vessels; factory ships and other vessels for processing or preserving fishery products	Shipbuilding & Ship Repair
8903	Yachts and other vessels for pleasure or sports; rowing boats and canoes	Shipbuilding & Ship Repair
8904	Tugs and pusher craft	Shipbuilding & Ship Repair
8905	Light-vessels. fire-floats. dredgers. floating cranes and other vessels the navigability of which is subsidiary to their main function; floating docks; floating or submersible drilling or production platforms	Shipbuilding & Ship Repair
8906	Other vessels. including warships and lifeboats other than rowing boats	Shipbuilding & Ship Repair
8907	Other floating structures (for example. rafts. tanks. coffer-dams. landing-stages. buoys and beacons)	Shipbuilding & Ship Repair
8908	Vessels and other floating structures for breaking up	Shipbuilding & Ship Repair
SERVICES:		
206	Sea transport	Maritime Transports
207	Passenger	Maritime Transports
208	Freight	Maritime Transports
209	Other	Maritime Transports

Source: COMTRADE

4.3.1 Market shares

The countries under comparison were selected within the European top exporters in 2015 in the products included in category HS (Harmonized System) 03 – Fish and crustaceans, mollusks and other aquatic invertebrates". The list of countries is presented in Table 19, which also presents the value of the exports of these products. Norway was actually the world second most important exporter, after China. Although based on this assumption, for both the exports of the options "89 - Ships, boats and floating structures" and 89 and 03 together, all the countries from Table 18 are also part of the top 20. Interestingly, within the selected countries there are also countries that receive the largest shares of the *European Maritime and Fisheries Fund* (previously addressed in Section 3): Spain, France, Italy, Poland and Portugal.

Table 19: Top 15 European countries exporter in 2015 of 03 - Fish and crustaceans, mollusks and other aquatic invertebrates

Top 15 (03) exporter european countries - 2015		
Country	**Trade Value US ($)**	
Norway	8902078405	1st
Sweden	3525044563	2nd
Spain	2821846991	3rd
Netherlands	2648826885	4th
Denmark	2327415012	5th
Germany	1613584481	6th
Iceland	1603693089	7th
France	1317956166	8th
Poland	1210364197	9th
Portugal	873058626	10th
Belgium	781877071	11th
Greece	646586257	12th
Ireland	566163244	13th
Italy	432631281	14th
Lithuania	408597647	15th

Source: Own elaboration based on data from COMTRADE

The comparison of exports across countries was based mainly on the first and last year of the period under study, due to the lack of data for some years, mainly on the exports of the maritime transports (Table 20). The values presented are the sum of exports of fisheries and

related activities, shipbuilding and ship repair and maritime transports, except for the case of Spain and Belgium, in which because of the absence of the MT exports value in one of the years, it is only considered the values for F&RA and SB&SR.

From 2000 to 2014, the country whose exports in these areas grew the most was Portugal, with a growth rate of 3.2%, followed by Lithuania and Poland. On the other hand, the ones with the lowest growth rates were Sweden, Italy and Iceland. The average growth rate of the countries' exports from 2000 to 2014 was 1.4% and Norway, Denmark, Germany, France, Poland, Portugal and Lithuania were above the average.

Table 20: Value of exports (US$) of the goods and services of the main European maritime sectors in 2000 and 2014

Exports ($)			
	2000	**2014**	**Growth rate**
Norway	13024168699	30611477481	1.4
Sweden	3857470159	4855524261	0.3
Spain	2720496291	5005863282	0.8
Netherlands	9073777941	19131257768	1.1
Denmark	13189456705	40416611815	2.1
Germany	10181652500	37823342181	2.7
Iceland	1257754378	2151691692*	0.7
France	7026559425	22844073696	2.3
Poland	2086114328	8117944053	2.9
Portugal	523096174	2173577953	3.2
Belgium	519244328	1164050249	1.2
Greece	7915398121	16122021541	1.0
Ireland	507690560	947032882	0.9
Italy	6888668747	9869382752	0.4
Lithuania	270875275	1102823009	3.1

Source: Own elaboration based on information of COMTRADE

* Estimated value[7]

Market shares were also computed to complement the broad information on exports. This indicator is estimated for each product, set of products and services as follows:

$$Market\ Share = \frac{National\ Exports\ of\ product\ x}{World\ Exports\ of\ product\ x} \quad (1)$$

[7] Values estimated through the application of the average growth rate of all the other considered years

Market shares assess the relevance of a country in the total of the exports of the world of a given product. When countries suffer a decrease on the shares of export market that may indicate that the exports of that product have dropped or that that country's product exports are not maintaining the same growth rate as the world exports and is declining its relative importance on the global scale.

The analysis on the evolution of the market shares was made taking into account the three major groups previously indicated: fisheries and related activities, shipbuilding and ship repair and maritime transports. Four different years were selected: 2000, 2004, 2009 and 2014, in order to get a general perspective of their evolution during the 200-2014 period.

Table 21 and 22 present the results.

Table 21: Market Shares of products from the groups of fisheries and related activities and shipbuilding and ship repair

			2000	2004	2009	2014				2000	2004	2009	2014
Norway	**F&RA**	**03**	0.08	0.08	0.16	0.17	**Poland**	**F&RA**	**03**	0.00	0.01	0.02	0.02
		1604	0.01	0.10	MV	MV			**1604**	0.01	0.27	MV	MV
		1605	0.03	0.02	0.01	0.00			**1605**	0.00	0.00	0.00	0.00
	SB&SR	**89**	0.03	0.02	0.02	0.02		**SB&SR**	**89**	0.03	0.06	0.03	0.07
Sweden	**F&RA**	**03**	0.01	0.02	0.04	0.06	**Portugal**	**F&RA**	**03**	0.01	0.01	0.01	0.01
		1604	0.01	0.18	MV	MV			**1604**	0.01	0.26	MV	MV
		1605	0.00	0.00	0.00	0.00			**1605**	0.00	0.00	0.00	0.00
	SB&SR	**89**	0.01	0.01	0.00	0.00		**SB&SR**	**89**	0.00	0.00	0.00	0.00
Spain	**F&RA**	**03**	0.03	0.04	0.06	0.05	**Belgium**	**F&RA**	**03**	0.01	0.01	0.02	0.01
		1604	0.05	0.91	MV	MV			**1604**	0.01	0.17	MV	MV
		1605	0.01	0.02	0.01	0.01			**1605**	0.01	0.02	0.02	0.01
	SB&SR	**89**	0.03	0.05	0.01	0.01		**SB&SR**	**89**	0.00	0.00	0.00	0.00
Netherlands	**F&RA**	**03**	0.03	0.04	0.05	0.05	**Greece**	**F&RA**	**03**	0.01	0.01	0.02	0.01
		1604	0.01	0.24	MV	MV			**1604**	0.00	0.04	MV	MV
		1605	0.06	0.05	0.05	0.02			**1605**	0.00	0.00	0.00	0.00
	SB&SR	**89**	0.02	0.03	0.02	0.03		**SB&SR**	**89**	0.00	0.00	0.00	0.00
Denmark	**F&RA**	**03**	0.04	0.04	0.04	0.04	**Ireland**	**F&RA**	**03**	0.01	0.01	0.01	0.01
		1604	0.04	0.67	MV	MV			**1604**	0.00	0.07	MV	MV
		1605	0.05	0.06	0.05	0.04			**1605**	0.01	0.01	0.00	0.00
	SB&SR	**89**	0.01	0.01	0.01	0.01		**SB&SR**	**89**	0.00	0.00	0.00	0.00
Germany	**F&RA**	**03**	0.01	0.01	0.03	0.03	**Italy**	**F&RA**	**03**	0.01	0.01	0.01	0.01
		1604	0.05	1.01	MV	MV			**1604**	0.01	0.31	MV	MV
		1605	0.01	0.01	0.01	0.01			**1605**	0.00	0.00	0.00	0.00
	SB&SR	**89**	0.04	0.06	0.03	0.06		**SB&SR**	**89**	0.06	0.07	0.05	0.05
Iceland	**F&RA**	**03**	0.02	0.03	0.03	0.03	**Lithuania**	**F&RA**	**03**	0.00	0.01	0.00	0.01
		1604	0.00	0.04	MV	MV			**1604**	0.00	0.14	MV	MV
		1605	0.03	0.03	0.00	0.01			**1605**	0.00	0.00	0.00	0.00
	SB&SR	**89**	0.00	0.00	0.00	0.00		**SB&SR**	**89**	0.00	0.00	0.00	0.00
France	**F&RA**	**03**	0.02	0.02	0.03	0.02							
		1604	0.04	0.44	MV	MV							
		1605	0.01	0.01	0.01	0.01							
	SB&SR	**89**	0.05	0.03	0.02	0.02							

Source: Own elaboration based on data from COMTRADE

Table 22: Market Shares of Maritime Transports services

		2000	2004	2009	2014			2000	2004	2009	2014
Norway	**206**	0.07	0.05	0.03	0.06	**Poland**	**206**	0.01	0.00	0.00	0.00
	207	0.06	0.06	0.05	0.01		**207**	0.00	0.00	0.01	MV
	208	0.07	0.04	0.03	0.06		**208**	0.01	0.00	0.00	MV
	209	0.10	0.10	0.04	0.08		**209**	0.00	0.00	0.00	MV
Sweden	**206**	0.03	0.02	0.01	0.01	**Portugal**	**206**	0.00	0.00	0.00	0.00
	207	0.04	0.01	0.01	0.00		**207**	0.00	0.00	0.00	MV
	208	0.03	0.02	0.01	0.02		**208**	0.00	0.00	0.00	MV
	209	0.01	0.01	0.01	0.00		**209**	0.00	0.00	0.01	MV
Netherlands	**206**	0.06	0.04	0.02	0.04	**Belgium**	**206**	MV	0.03	0.03	0.03
	207	0.01	0.02	0.01	MV		**207**	MV	0.00	0.00	0.00
	208	0.06	0.04	0.02	MV		**208**	MV	0.03	0.03	0.03
	209	0.09	0.05	0.03	MV		**209**	MV	0.04	0.05	0.04
Denmark	**206**	0.09	0.08	0.08	0.12	**Greece**	**206**	0.07	0.07	0.05	0.05
	207	MV	0.06	0.06	0.02		**207**	0.01	0.02	0.02	0.00
	208	MV	0.09	0.09	0.17		**208**	0.08	0.08	0.06	0.00
	209	MV	0.03	0.02	0.01		**209**	0.03	0.02	0.00	0.19
Germany	**206**	0.07	0.07	0.08	0.10	**Ireland**	**206**	0.00	MV	0.00	0.00
	207	0.06	0.05	0.05	0.01		**207**	0.02	MV	0.01	0.00
	208	0.07	0.07	0.09	0.13		**208**	0.00	MV	0.00	0.00
	209	0.04	0.02	0.03	0.03		**209**	0.00	MV	0.00	0.00
Iceland	**206**	0.00	0.00	0.00	MV	**Italy**	**206**	0.04	0.03	0.02	0.02
	207	MV	MV	MV	MV		**207**	0.01	0.00	0.01	0.00
	208	0.00	0.00	0.00	MV		**208**	0.02	0.01	0.01	0.01
	209	0.00	0.00	0.00	MV		**209**	0.09	0.11	0.05	0.03
France	**206**	0.03	0.03	0.03	0.07	**Lithuania**	**206**	0.00	0.00	0.00	0.00
	207	0.07	0.08	0.06	0.02		**207**	0.00	0.00	0.00	MV
	208	0.03	0.03	0.04	0.08		**208**	0.00	0.00	0.00	0.00
	209	0.03	0.03	0.03	0.01		**209**	0.00	0.00	0.00	MV

Source: Own elaboration based on data from COMTRADE

Product 03 - *Fish and crustaceans. mollusks and other aquatic invertebrates* is constituted by products 0301, 0302, 0303, 0304, 0305, 0306, 0307 and 0308, so the sum of the values of exports of all those products were considered in order to evaluate the market shares of this set of products for all the countries under analysis. It becomes clear the low importance of the European countries in the international market, as market shares are relatively low, except in the cases of Norway, Sweden, Spain, Netherlands and Denmark. In the case of Norway, which was, as previously mentioned, the second most important exporter of products (03) in 2015, this share is not surprising, especially during the year 2014.

For product 1604 - *Prepared or preserved fish; caviar and caviar substitutes prepared from fish eggs* there was a very significant number of missing values that made it impossible to obtain the value of the world exports for the years 2009 and 2014. The analysis of the market shares of this product was then made only for the years 2000 and 2004. The most important exporter is Germany, followed by Spain, Denmark and France. These four countries reached an important share of the world market, whereas the other European countries presented a minor presence within the global market.

Concerning product 1605 - *Crustaceans. mollusks and other aquatic invertebrates. prepared or preserved,* in general, the importance of the European exports within the world market was reduced in all the studied years, in which Denmark and Netherlands were the ones with the highest shares, mainly in 2004 and 2009.

Regarding product 89 - *Ships. boats and floating structures,* which is constituted by product 8901, 8902, 8903, 8904, 8905, 8906, 8907 and 8908 and the sum of the value of the exports of each, it is perceptible a clear dominance of Germany, France, Poland and Italy, whose ship industries have an important share in the international market, at least in absolute terms and values.

For the group of maritime transports, the services of sea transports, in terms of passenger, freight and other types were considered (Table 18). The aim was once again to understand the importance of the exports of maritime transports of the European countries in the total of the world exports of these services (see Table 22). Due to the significance of the freight transport in the international trade and also in the scope of the maritime transports, these results are especially worthy of attention. For the period under analysis, the countries that possess higher

market shares on freight maritime transports were Norway, Denmark, Germany, France and Greece, whereas countries such as Portugal, Ireland, Lithuania and Iceland showed a very little significance on the world market of maritime transports.

In sum, based on the information above it became clear that the Portuguese position in the international scene is relatively weak, remaining in this situation during the period under analysis.

4.3.2 Unit values

Unit values are used in this study as a way to assess the competitiveness. Effective price measures are fundamental for establishing temporal and geographic comparisons, namely between countries, in what concerns, for instance, purchasing power and welfare, and unit values are an accurate indicator for that (McKelvey, 2011).
Unit values constitute an indicator related to the measurement of quality, productivity and value added of a product or set of products. In the case of the unit value of exports, used in this study, it is calculated as follows:

$$Unit\ Value = \frac{Value\ of\ Exports}{Quantity} \quad (1)$$

Usually, the quantity is measured in Kilograms, however, in this study the products are divided into different categories and the quantity measures differ. The analysis is thus made taking into account distinct groups: fisheries and related activities, shipbuilding and ship repair and maritime transports. In order to calculate unit values, several products were selected to be part of the groups and the analysis. As the category of maritime transports is mainly constituted by services, its analysis is only made in terms of the value of exports.

Unit values may be used as an "indicator for the assessment of the competitive position of industries" (Aiginger, 1997, p: 571) as low unit values mean reduced costs and high unit values mean higher quality or more processed products. The more transformed a product is, the higher its unit value, as the adding of characteristics and transformation is valued by consumers, who are willing to pay more for the product. In the case of homogeneous goods, unit value may be closed to the unit cost, as competition reduces price to marginal costs. In

short, unit value increases when labour or capital is added to the production. A product is perceived as superior when some innovation on the product occur, which is the vertical product differentiation, and then consumers are willing to pay more and this leads to increased unit value (Aiginger, 1997). Following Aiginger's perspective, countries with higher unit values may be perceived as supplying more quality, due to skills or technology, or to the focus on a higher segment of the product.

Table 23 shows the evolution of the unit values of the products of fisheries and related activities from 2000 to 2014. Although they were considered on the same table and as belonging to the same set of products (Fisheries and related activities), the analysis was made individually considering the products previously indicated on Table 18. As previously indicated, product 03 is constituted by many other products so once again this set of products is considered altogether. The quantity of these products was expressed in "weight in Kilograms" as data indicated that the products of fisheries, both without and with transformation were internationally sold in terms of kilos.

Table 23: Unit values of the products from the group of fisheries and related activities

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Norway	**03**	1.8	1.9	1.9	2.0	2.4	2.8	3.3	3.2	3.3	2.9	3.5	4.1	4.0	4.0	4.2
	1604	2.9	3.4	3.8	3.1	2.6	3.0	3.0	3.6	3.3	2.4	2.6	3.5	3.8	3.3	3.0
	1605	5.7	5.0	5.0	5.4	5.8	6.0	6.1	7.3	8.2	7.5	7.5	9.0	10.0	11.5	11.5
Sweden	**03**	1.6	1.6	1.8	2.3	2.7	3.1	3.5	MV	3.9	3.8	4.5	MV	MV	MV	MV
	1604	3.0	2.7	3.2	3.7	4.0	4.2	4.5	4.9	5.7	5.1	5.3	6.1	5.9	5.9	5.7
	1605	6.8	5.8	6.2	7.0	7.4	7.3	8.5	8.7	10.8	10.1	9.5	10.5	10.8	11.5	11.7
Spain	**03**	2.0	1.9	2.2	2.5	2.8	2.7	2.9	3.3	34	2.7	3.0	3.6	3.5	3.7	3.4
	1604	2.9	3.2	3.5	4.1	4.4	4.4	4.7	5.1	6.2	5.8	5.4	6.1	6.3	6.8	6.3
	1605	2.6	2.7	2.9	3.6	3.9	4.0	3.9	4.0	4.2	3.9	4.3	5.0	4.6	4.5	4.3
Netherlands	**03**	1.8	1.8	1.8	2.0	2.0	2.2	2.3	3.0	3.6	MV	3.1	4.1	3.7	3.9	3.4
	1604	3.1	2.9	3.7	3.9	4.3	3.9	3.1	5.2	4.6	4.0	4.9	5.2	5.8	6.1	6.3
	1605	6.6	6.4	6.8	8.4	9.0	8.9	8.6	11.2	12.8	7.4	11.0	11.1	8.2	9.0	11.0
Denmark	**03**	3.1	2.9	3.2	3.3	1.4	3.9	4.2	4.0	5.0	248.9	4.0	5.2	4.5	4.4	4.5
	1604	2.7	2.9	3.2	3.7	4.0	4.0	4.1	4.4	4.9	5.1	4.8	5.7	5.8	5.7	5.2
	1605	5.6	5.4	5.8	6.6	6.9	6.8	6.8	7.8	8.6	7.6	7.6	9.3	9.7	9.8	9.7
Germany	**03**	2.9	2.1	2.9	3.3	2.8	2.5	2.9	3.7	3.9	4.3	3.7	4.5	4.0	4.2	4.3
	1604	2.6	2.6	2.9	3.3	3.4	3.4	3.6	4.2	4.6	4.4	4.1	4.6	4.5	4.6	4.6
	1605	5.9	4.9	5.1	5.8	6.2	6.2	7.0	6.9	7.6	7.3	7.2	8.6	8.0	9.4	11.8
Iceland	**03**	3.2	3.1	3.0	3.1	3.2	3.2	3.4	4.1	3.9	3.5	3.3	3.8	3.4	3.3	3.6
	1604	5.4	5.1	5.0	6.6	5.9	5.5	5.9	6.5	7.7	8.5	8.6	8.2	6.9	6.6	6.3
	1605	5.8	5.1	4.9	5.2	5.9	5.8	5.5	6.6	14.0	14.0	6.6	8.2	9.0	8.6	10.0
France	**03**	2.6	2.6	3.0	2.9	3.5	4.2	4.4	5.5	5.1	5.0	5.4	6.3	5.5	6.2	6.6
	1604	2.8	3.2	3.6	4.5	4.9	4.5	4.9	4.6	7.1	6.6	6.2	6.7	6.8	6.9	7.0
	1605	5.2	5.1	5.9	7.9	9.3	9.2	8.9	9.2	10.4	10.0	9.7	10.9	10.0	11.1	11.9
Poland	**03**	2.7	2.6	3.0	3.8	5.1	5.2	6.2	4.9	6.2	4.9	6.7	7.2	7.5	7.4	9.3
	1604	1.5	1.8	2.2	2.4	2.1	2.8	3.0	3.4	4.0	3.8	3.8	3.8	4.2	4.4	4.3
	1605	8.3	9.8	10.1	11.4	10.7	11.1	9.9	12.0	13.8	9.6	8.5	8.1	MV	9.8	9.5

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Portugal	**03**	2.9	2.8	2.7	3.1	3.4	MV	4.0	4.5	4.5	4.4	4.1	4.9	4.3	4.0	4.4
	1604	3.1	3.1	3.5	4.2	4.5	4.6	5.0	5.5	6.1	6.2	5.4	5.5	5.5	5.6	5.1
	1605	4.4	5.3	5.0	5.3	5.7	5.1	4.3	4.6	3.9	4.5	4.0	4.1	4.6	4.6	4.5
Belgium	**03**	4.8	4.5	5.1	5.6	5.8	6.1	6.6	7.0	6.9	6.8	7.2	8.4	7.6	7.7	8.2
	1604	4.4	3.7	3.5	4.1	5.0	5.7	5.5	6.6	7.2	7.2	6.6	7.4	7.0	7.5	6.9
	1605	5.8	5.8	6.2	7.1	7.0	7.3	7.5	8.1	8.3	8.2	8.0	8.7	8.6	9.2	10.4
Greece	**03**	2.6	2.9	3.1	3.7	4.5	4.6	4.4	4.4	4.8	4.9	5.2	6.6	5.9	5.8	6.3
	1604	3.0	0.4	3.6	3.8	3.7	4.4	8.1	10.2	10.2	9.7	9.6	10.5	6.3	6.8	6.9
	1605	5.7	5.7	5.6	6.5	6.8	5.8	6.7	9.1	9.4	8.8	7.9	8.2	7.3	8.0	9.6
Ireland	**03**	1.4	1.3	1.3	1.6	1.8	2.2	2.9	3.0	2.8	2.5	2.1	3.2	2.2	2.4	2.6
	1604	2.2	2.5	2.6	3.2	3.3	3.5	3.9	4.6	4.6	4.8	4.1	4.0	5.9	7.2	6.2
	1605	3.1	2.8	3.2	4.1	4.4	4.4	4.1	5.1	5.3	4.6	3.8	3.9	9.0	8.4	8.4
Italy	**03**	2.6	2.7	3.3	3.6	3.9	4.0	4.5	4.7	5.1	4.4	4.4	5.3	4.5	4.6	4.7
	1604	3.9	4.3	4.2	5.1	5.7	6.0	6.6	7.7	8.7	8.5	8.6	9.6	9.0	9.5	9.3
	1605	6.8	6.4	6.7	8.2	8.7	8.5	9.0	10.2	10.5	9.9	9.3	9.8	9.0	9.4	9.3
Lithuania	**03**	1.3	1.0	1.0	1.2	1.7	1.6	2.0	2.0	2.3	2.3	3.7	5.2	4.7	5.0	5.7
	1604	1.1	1.0	1.4	1.8	2.2	2.6	2.9	3.4	4.3	4.6	4.5	3.3	3.3	3.3	3.3
	1605	5.5	1.5	4.5	4.1	4.9	4.6	4.7	6.6	7.8	7.6	7.8	8.5	8.1	8.8	9.1

Source: Own elaboration based on data from COMTRADE

Despite the lack of some data (indicated as MV – *missing value* in the table), it is possible to conclude that from 2000 to 2014, all the countries under analysis showed a positive evolution in the unit values of the set of products 03, though some showed a more positive evolution than others, such as Poland, whose unit values of 03 have grown brightly.

For both the products 1604 and 1605, which possess higher level of transformation and, consequently higher unit values, all the 15 European countries analysed demonstrated a positive development, as in all cases the values of the more recent years were clearly higher than the values of the first years.

Individually considering Portugal, and taking into account the products from the group of fisheries and related activities, it can be seen that although there was a general growth on the unit values of the different products, the most important one was the set of products 03, which is, from the three, the less valuable in general terms, as the other two incorporate more transformation.

In order to facilitate interpretation, unit values were also classified into "low", "medium" and "high", depending if this values locates below percentile 33 (low), above percentile 66 (high) or between these two (medium). Basically, it allows to segment the exports of these countries into less valuable or more valuable. Once again, this estimation was made considering the set of products 03, and products 1604 and 1605 for the years 2000, 2004, 2009 and 2014. The results are presented in Table 24.

Table 24: Classification of Unit Values into low, medium and high categories

	2000			2004			2009			2014		
	3	**1604**	**1605**	**3**	**1604**	**1605**	**3**	**1604**	**1605**	**3**	**1604**	**1605**
Norway	L	M	M	L	L	L	L	L	M	L	L	H
Sweden	L	M	H	M	M	H	M	M	H	MV	M	H
Spain	M	M	L	M	M	L	L	M	L	L	M	L
Netherlands	L	H	H	M	M	H	MV	L	L	L	H	H
Denmark	H	L	M	L	M	M	H	M	M	M	M	M
Germany	H	L	H	M	L	M	M	L	L	M	L	H
Iceland	H	H	M	M	H	M	L	H	H	L	M	M
France	M	M	L	H	H	H	H	H	H	H	H	H
Poland	M	L	H	H	L	H	H	L	H	H	L	M
Portugal	H	H	L	M	H	L	M	M	M	M	L	L
Belgium	H	H	M	H	H	M	H	H	M	H	H	M
Greece	M	M	M	H	M	M	H	H	M	H	H	M
Ireland	L	L	L	L	L	L	L	M	L	L	M	L
Italy	M	H	H	H	H	H	M	H	H	M	H	L
Lithuania	L	L	L	L	L	L	L	L	M	H	L	L

Legend: L = Low; M = Medium; H = High
Source: Own elaboration, based on data from COMTRADE

Considering a "Top 3" of the countries that are placed in the percentile of the highest unit values and which are most of the time placed in the "high" category, we find France, which has been gaining throughout the years, Italy, that although mostly placed in the high category, has been actually losing value in the 1605 product and Belgium, which has been maintaining a strong position in all the products except product 1605, which was placed in the "medium" category in all the considered years.

On the other hand, the "Top 3" of the countries delivering the weakest results in comparative terms were Norway, Ireland and Lithuania. Norway was, as previously mentioned, the second most important exporter of 03 products in the world in 2015. It is, thus, quite impressive that the unit values of the products of the fisheries and related activities groups place themselves on the "low" category in all the considered years, which means that these unit values made part of the 33% lowest values of the studied countries. Both Ireland and Lithuania, although exporting 03, 1604 and 1605 products in big quantities, and, because of that, placing

themselves on the European top exporter countries, do not present high unit values on such exports, when comparing to the other studied European countries.

In what concerns the performance of Portugal in terms of unit values of the products of fisheries and related activities and its comparative positions within the set of European countries analysed, it is visible that these products from Portugal were mainly placed on medium categories, which indicates an average relative position of Portugal concerning the exports of the referred products.

In what concerns the unit values of the products of the group of shipbuilding and ship repair, there was a massive lack of data on export quantities, as in most of the cases of the countries studied, it was only possible to consider the value of exports and market shares (previously discussed in this chapter). Thus, an attempt was made to understand which countries had enough data to be considered and fit these countries with the years which presented more available data, which were 2000, 2005 and 2010.

For these years, the countries with more data for both the value and the quantity of exports of the set of product 89 - *Ships. boats and floating structures*, which is constituted by products 8901, 8902, 8903, 8904, 8905, 8906, 8907 and 8908 (see table A.13), were Norway, Sweden, Spain, France, Poland, Portugal, Ireland and Italy. Once again, the sum of the exports values and the sum of the quantities were computed to find the general values of product 89. All the mentioned products' traded quantities were expressed in "number of items". From the analysis of the considered years and countries, it can be seen that countries present very distinct unit values and evolutions from 2000 to 2010. Some countries present high unit values on this set of products (Portugal, France, Ireland and Italy) whereas other present poor results on this indicator, such as Norway and Poland. Although the lack of data make it impossible to clearly characterize the performance of all the European countries considered in this study concerning the group of products of shipbuilding and ship repair, it is possible to establish the evolution of these on some of the most important European industries of shipbuilding and ship repair, which has not been homogeneous nor regular (Table 25).

Table 105: Unit values of the products of shipbuilding and ship repair in 2000, 2005 and 2010

		2000	2005	2010			2000	2005	2010
Norway		0.57	1.81	1.39	**Poland**		2.43	1.96	1.90
Sweden	**SB&SR 89**	8.68	2.14	2.58	**Portugal**	**SB&SR 89**	MV	7.27	10.20
Spain		3.37	3.85	3.24	**Ireland**		8.85	7.91	MV
France		5.50	7.91	MV	**Italy**		5.86	8.01	MV

Source: Own elaboration based on data from COMTRADE

On the overall, it is not easy to make a general assessment of the results of this indicator for the Portuguese Maritime Cluster as a whole. Although there are some positive findings on the unit values of the products of the group of fisheries and related activities that are somehow equivalent or at least similar to the European countries analysed, these are products with low value added, that do not creat the wealth that, for instance, products from the group of shipbuilding and ship repair would. Concerning those, there is not possible to make a fair and safe judgements on the performance of the its products and unit values, due to the extensive lack of data verified for the considered period.

4.3.3 Patents

In order to get a grasp on the factors underlying the evolution of unit values and understand if some changes have been in place regarding the innovativeness of the Portuguese maritime cluster, an investigation was also made regarding the evolution of patents. Patents and trademarks are appropriate indicators to evaluate the degree of innovation in some products and, generally speaking, in some sectors or activity, as the concept is closely associated with modernization and newness. The World Intellectual Property Indicators defines patent as "a set of exclusive rights granted by law to applicants for an invention that meets the standards of novelty, non-obviousness and industrial applicability. It is valid for a limited period (generally 20 years), during which time the patent holder can commercially exploit the invention on an exclusive basis. In return, applicants are obliged to disclose their inventions to the public, so that others, skilled in the art, may replicate them. The patent system is designed to encourage innovation by providing innovators with time-limited exclusive legal rights, thus enabling them to appropriate the returns from their innovative activity" (WIPO, 2015, p. 63)

The Portuguese Statistical Office refers to patent as an exclusive right to explore the associated invention within all the Portuguese territory as well as the right to prevent that others use it without permission.

To get the number of patent applications of the sectors of the maritime cluster, we used the Portuguese Industrial Property database (INPI). In this database it is not possible to search for the patents of a specific sector, as it is only possible to search by textual components. We used the option of searching words considering: *Pesca* (fishery), *Aquacultura* (aquaculture), *Oceano* (ocean), *Mar* (sea), *Marítimo* (maritime), *Energia das ondas* (wave energy), *Barco* (boat), *Embarcação* (vessel), *Peixe* (fish), *Naval* (naval), *Navio* (ship). Initially, the total of results were of 628. After exporting and organizing the data, by deleting repeated cases, the total were 555 patent applications, from 1960 to 2014. Figure 13 shows the evolution on the number of patent application during 54 years. Although the tendency is not clear, from almost the beginning of the century these requests had been increasing, mainly until 2008, when the number of patent application reached its peak, and since then, this number has been decreasing quickly, maybe due to the severe economic crisis that might have retracted this indicator. Table A.12 (annex) shows the total of the results for each of the searched words after the removal of the repeated requests.

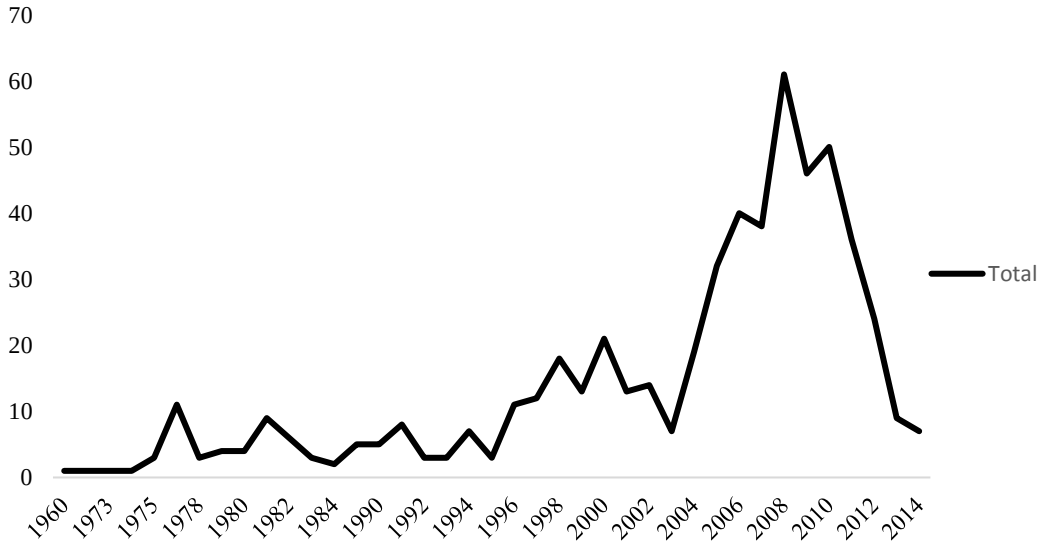

Figure 13: Evolution on the number of patent applications on the theme from 1960 to 2014
Source: Own elaboration based on data from INPI, 2016

4.3.4. Revealed Comparative Advantage

The Balassa Index of Revealed Comparative Advantage (BI) measures the importance of the exports of a given product in the total of exports of a country over the importance of the exports of the same product in the total of exports of a region of reference in a determined period, normally one year. When BI is higher than 1, the country has revealed comparative advantage on the product, whereas when BI is lower than 1, the country has a comparative disadvantage on the product, as the share of exports of the product in the total of the exports of the region of reference is larger than in the country under analysis.

Taking as reference the region composed by the European countries previously indicated, the results show that Portugal had comparative advantage on products 03 - *Fish and crustaceans, molluscs and other aquatic invertebrates* and 1604 - *Prepared or preserved fish; caviar and caviar substitutes prepared from fish eggs*, whereas had disadvantage on products 1605 - *Crustaceans, molluscs and other aquatic invertebrates, prepared or preserved* and 89 - *Ships, boats and floating structures* (Figure 14). Comparing Portugal's performance on the production of the products from the group of fisheries and related activities with the performance of the European countries under analysis, it can be seen that Portugal has comparative advantage in products with less transformation and value added and comparative disadvantage in more processed and value added ones.

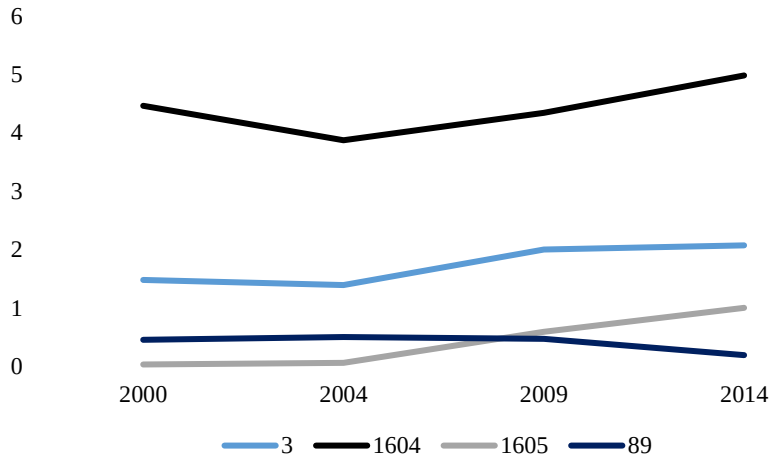

Figure 14: Evolution of the RCA Index for the products of F&RA and SB&SR

Source: Comtrade

Concerning the services of maritime transports, the calculation of RCA for the years of 2000, 2004, 2009 and 2014 had to be done with some adaptations, since several data were missing.[8].

For this period, it is visible the clear disadvantage Portugal had in all the activities of the maritime transports, except for the case of 209 "Others", mainly after 2004. This service includes the maritime transport that is neither done for passenger nor for freight.

Despite the lack of data for the years 2009 and 2014, previous data for 2000 and 2004 allow to conclude that Portugal had not developed a comparative advantage in these activities (Table 25 and Figure 15). This disadvantage may represent the lack of offer of attractive services and prices from the companies that operate in them, which may not still taking full advantage of its potentiality, given the current importance of maritime transports in international trade.

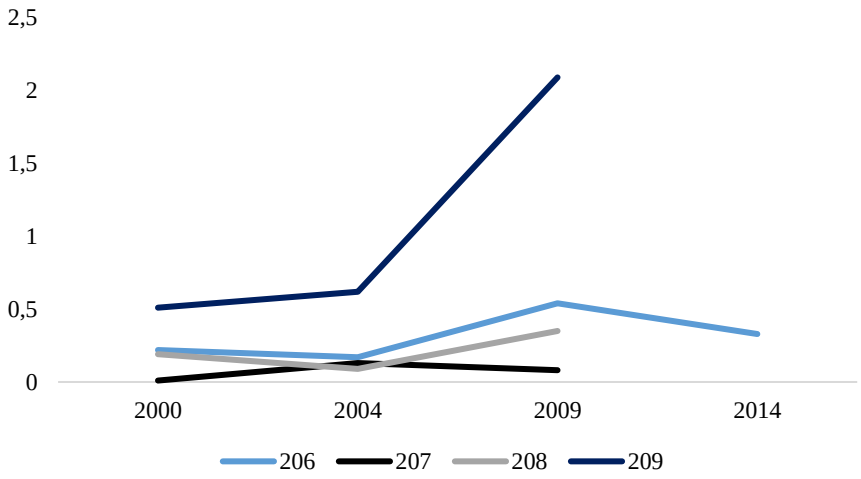

Figure 15: Evolution of the RCA Index for the services of MT

Source: COMTRADE

[8] Table A. 13 (annex) indicates the considered countries on the region of reference that allowed the calculation of the index of comparative advantage of Portugal.

Table 26: RCA of the products and services of the Portuguese maritime cluster in 2000, 2004, 2009 and 2014

		2000	2004	2009	2014
	03	148	1.39	2.00	2.07
	1604	4.46	3.87	4.34	4.98
F&RA	**1605**	0.03	0.06	0.59	1.00
SB&SR	**89**	0.45	0.50	0.47	0.19
	206	0.22	0.17	0.54	0.33
MT	**207**	0.01	0.13	0.08	MV
	208	0.19	0.09	0.35	MV
	209	0.51	0.62	2.09	MV

Source: Own elaboration based on data from COMTRADE

Through the compilation of the indicators considered on this chapter, characterized, overall, by a clear decline, there is apparently a loss of competitiveness of the Portuguese Maritime Cluster, both national and internationally. Nationally, the cluster is constituted mainly by micro-enterprises from the group of fisheries and related activities. Those are essentially geographically concentrated on the regions of Porto and Lisbon Metropolitan areas, Aveiro, West, Algarve and Azores, and have been constantly reducing the number of employees during the analysed period. Its Gross Value added have been experiencing a declining trend, as well as the investment, which was here considered in terms of Gross Fixed Capital Formation.

Concerning the international scope, during the considered years, the Portuguese Maritime Cluster have not shown signs of competitiveness, as its exports shares remained with extremely low importance in the global market as well as the unit values associated with these exports. The revealed comparative advantage had been confirmed in the products of the fisheries and related activities, which are the lower value added ones, whereas there was indicated a constant comparative disadvantage on the products and services of the groups of shipbuilding and ship repair and maritime transports.

6. Conclusion

The purpose of this study was to evaluate the competitiveness of the activities that belong to the Portuguese Maritime Cluster, taken as being composed by fisheries and related activities, shipbuilding and ship repair and maritime transports. Despite the fact that this cluster is not formally institutionalized, as, for instance, in Spain, the study assumed the conception of cluster as a regional agglomeration of activities that are interconnected and operate within the maritime sectors.

Leveraged by the literature on the concept of competitiveness and its relationship with agglomeration economies and clusters, an analysis is made of the Portuguese case, taking into account the political and legislative setting, and the evaluation of major economic indicators based on the economic activity on the sea.

The assessment of competitiveness was made taking other European countries as benchmark. The European countries included in the comparison were the most important exporters of Fish and crustaceans, molluscs and other aquatic invertebrates (HS category 03) in 2015.

Portugal has a strong link with the ocean, possessing the largest Economic Exclusive Zone in the European Union. The geographical location offers thus a natural competitive advantage to the country. This fact along with the increasing political attention devoted to the topic stimulated the interest on the research of whether this competitive advantage has been materialized in practice.

To this purpose, several indicators were selected and evaluated from 2004 to 2014. An analysis of the changing domestic relevance of the cluster was made, based on the number of firms, employees, turnover, gross value added and gross fixed capital formation. The general findings indicate a sustained decline in virtually all indicators. The most important sector of activity regarded Fisheries and Related activities. In this sector, and also in the maritime sector as a whole, most firms are micro-sized, operating with less than 10 employees (over 90%). Furthermore, there is a strong geographical concentration in Porto and Lisbon Metropolitan areas, Algarve, Aveiro, West and Azores. This regional concentration might have strengthened competitiveness due to spillovers effects associated with the close interaction

and common scopes and objectives of firms, but apparently, the cluster has experienced a marked decay.

The assessment of the domestic relevance was complemented with the computation of competitiveness indicators, namely Unit Values and Market Shares. Despite the slight increasing in the unit values of the products of the sectors of Fisheries and related activities, Shipbuilding and ship repair, Portugal is still behind countries such as France, Belgium, Denmark or Germany. In addition to this, the low importance of the Portuguese exports shares, and especially those less processed constitutes a matter of concern. Moreover, the computation of the Revealed Comparative Advantage index has shown that Portugal has been presenting a continuous disadvantage in highly value added products and services within the maritime industry, although it has consolidated a comparative advantage on low processed products.

In a nutshell, we come to the conclusion that neither the natural's competitive advantage of Portugal in the area, nor the political efforts put in the strengthening the wealth creation of the maritime exploration have been producing satisfactory outcomes. The sector is diminishing its importance at both the domestic and international levels.

Although this study provided useful insights on the sea cluster, several shortcomings can be pointed out. Despite the fact that the author cannot be blamed by the lack of data, it is clear that it has probably influenced its quality. Moreover, several other indicators may be considered in the analysis, along with a more extensive approach on other competitiveness features. These limitations may be suppressed in future research. Also, it seems to be of the utmost importance to find an explanation for the evidence that was displayed, in an attempt to understand the reasons that lie at the roots of the apparent lack of competitiveness and evaluate why other European countries, that at first sight do not possess such strong natural competitive advantage manage to be more competitive.

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ANNEXES

Table A.1: Geographical distribution of the companies of Fisheries and related activities in 2004. 2009 and 2014

	TOTAL						
NUTS 2002	2004		2009		**NUTS 2013**	2014	
	11471	**(%)**	**10528**	**(%)**		**8341**	**(%)**
11: Norte	2687	23%	2413	23%	11: Norte	1817	22%
111: Minho-Lima	420	4%	367	3%	111: Alto Minho	272	3%
112: Cávado	290	3%	248	2%	112: Cávado	193	2%
113: Ave	247	2%	216	2%	119: Ave	121	1%
114: Grande Porto	1230	11%	1107	11%	11A: Área Metropolitana do Porto	1019	12%
115: Tâmega	173	2%	180	2%	11B: Alto Tâmega	28	0%
116: Entre Douro e Vouga	137	1%	130	1%	11C: Tâmega e Sousa	112	1%
117: Douro	97	1%	78	1%	11D: Douro	38	0%
118: Alto Trás-os-Montes	93	1%	87	1%	11E: Terras de Trás-os-Montes	34	0%
16: Centro	2473	22%	2253	21%	16: Centro	1854	22%
161: Baixo Vouga	591	5%	646	6%	16B: Oeste	634	8%
162: Baixo Mondego	402	4%	338	3%	16D: Região de Aveiro	571	7%
163: Pinhal Litoral	181	2%	165	2%	16E: Região de Coimbra	310	4%
164: Pinhal Interior Norte	63	1%	57	1%	16F: Região de Leiria	150	2%
165: Dão-Lafões	144	1%	115	1%	16G: Viseu Dão Lafões	86	1%
166: Pinhal Interior Sul	11	0%	11	0%	16H: Beira Baixa	12	0%
167: Serra da Estrela	24	0%	22	0%	16I: Médio Tejo	63	1%
168: Beira Interior Norte	28	0%	23	0%	16J: Beiras e Serra da Estrela	28	0%
169: Beira Interior Sul	24	0%	17	0%	17: Área Metropolitana de Lisboa	1803	22%
16A: Cova da Beira	28	0%	17	0%	18: Alentejo	406	5%
16B: Oeste	862	8%	749	7%	181: Alentejo Litoral	247	3%
16C: Médio Tejo	115	1%	93	1%	184: Baixo Alentejo	39	0%
17: Lisboa	2631	23%	2445	23%	185: Lezíria do Tejo	64	1%
171: Grande Lisboa	1320	12%	1127	11%	186: Alto Alentejo	15	0%
172: Península de Setúbal	1311	11%	1318	13%	187: Alentejo Central	41	0%
18: Alentejo	690	6%	590	6%	150: Algarve	1683	20%
181: Alentejo Litoral	303	3%	300	3%	20: Região Autónoma dos Açores	661	8%
182: Alto Alentejo	61	1%	46	0%	30: Região Autónoma da Madeira	117	1%
183: Alentejo Central	77	1%	64	1%			
184: Baixo Alentejo	95	1%	65	1%			
185: Lezíria do Tejo	154	1%	115	1%			
150: Algarve	2140	19%	2003	19%			
20: Região Autónoma dos Açores	675	6%	680	6%			
30: Região Autónoma da Madeira	175	2%	144	1%			

Table A.2: Geographical distribution of the companies of Shipbuilding and Ship Repair in 2004. 2009 and 2014

	TOTAL						
NUTS 2002	2004		2009		**NUTS 2013**	2014	
	370	**(%)**	**418**	**(%)**		**343**	**(%)**
11: Norte	54	15%	60	14%	11: Norte	64	19%
111: Minho-Lima	15	4%	23	6%	111: Alto Minho	21	6%
112: Cávado	3	1%	3	1%	112: Cávado	7	2%
113: Ave	0	-	0	-	119: Ave	0	-
114: Grande Porto	36	10%	33	8%	11A: Área Metropolitana do Porto	35	10%
115: Tâmega	0	-	0	-	11B: Alto Tâmega	0	
116: Entre Douro e Vouga	0	-	1	0%	11C: Tâmega e Sousa	1	0%
117: Douro	0	-	0	-	11D: Douro	0	-
118: Alto Trás-os-Montes	0	-	0	-	11E: Terras de Trás-os-Montes	0	-
16: Centro	55	15%	59	14%	16: Centro	52	15%
161: Baixo Vouga	28	8%	31	7%	16B: Oeste	18	5%
162: Baixo Mondego	9	2%	8	2%	16D: Região de Aveiro	22	6%
163: Pinhal Litoral	0	-	1	0%	16E: Região de Coimbra	8	2%
164: Pinhal Interior Norte	1	0%	1	0%	16F: Região de Leiria	2	1%
165: Dão-Lafões	0	-	1	0%	16G: Viseu Dão Lafões	1	0%
166: Pinhal Interior Sul	0	-	0	-	16H: Beira Baixa	0	-
167: Serra da Estrela	0	-	0	-	16I: Médio Tejo	1	0%
168: Beira Interior Norte	0	-	0	-	16J: Beiras e Serra da Estrela	0	-
169: Beira Interior Sul	0	-	0	-	17: Área Metropolitana de Lisboa	128	37%
16A: Cova da Beira	0	-	0	-	18: Alentejo	2	1%
16B: Oeste	16	4%	15	4%	181: Alentejo Litoral	0	-
16C: Médio Tejo	1	0%	2	0%	184: Baixo Alentejo	1	0%
17: Lisboa	163	44%	164	39%	185: Lezíria do Tejo	0	-
171: Grande Lisboa	43	12%	58	14%	186: Alto Alentejo	1	0%
172: Península de Setúbal	120	32%	106	25%	187: Alentejo Central	0	-
18: Alentejo	7	2%	7	2%	150: Algarve	62	18%
181: Alentejo Litoral	3	1%	2	0%	20: Região Autónoma dos Açores	25	7%
182: Alto Alentejo	2	1%	3	1%	30: Região Autónoma da Madeira	10	3%
183: Alentejo Central	0	-	0	-			
184: Baixo Alentejo	2	1%	1	0%			
185: Lezíria do Tejo	0	-	1	0%			
150: Algarve	55	15%	75	18%			
20: Região Autónoma dos Açores	24	6%	35	8%			
30: Região Autónoma da Madeira	12	3%	18	4%			

Table A.3: Geographical distribution of the companies of Maritime Transports in 2004. 2009 and 2014

	TOTAL						
NUTS 2002	**2004**		**2009**		**NUTS 2013**	**2014**	
	263	**(%)**	**319**	**(%)**		**359**	**(%)**
11: Norte	24	9%	30	9%	11: Norte	27	8%
111: Minho-Lima	2	1%	4	1%	111: Alto Minho	3	1%
112: Cávado	2	1%	3	1%	112: Cávado	2	1%
113: Ave	2	1%	1	0%	119: Ave	1	0%
114: Grande Porto	15	6%	20	6%	11A: Área Metropolitana do Porto	20	6%
115: Tâmega	1	0%	1	0%	11B: Alto Tâmega	1	0%
116: Entre Douro e Vouga	0	-	1	0%	11C: Tâmega e Sousa	0	-
117: Douro	1	0%	0	-	11D: Douro	0	-
118: Alto Trás-os-Montes	1	0%	0	-	11E: Terras de Trás-os-Montes	0	-
16: Centro	20	8%	24	8%	16: Centro	44	12%
161: Baixo Vouga	4	2%	6	2%	16B: Oeste	18	5%
162: Baixo Mondego	4	2%	4	1%	16D: Região de Aveiro	12	3%
163: Pinhal Litoral	0	-	0	-	16E: Região de Coimbra	7	2%
164: Pinhal Interior Norte	0	-	0	-	16F: Região de Leiria	2	1%
165: Dão-Lafões	1	0%	0	-	16G: Viseu Dão Lafões	3	1%
166: Pinhal Interior Sul	0	-	0	-	16H: Beira Baixa	0	-
167: Serra da Estrela	0	-	0	-	16I: Médio Tejo	2	1%
168: Beira Interior Norte	0	-	0	-	16J: Beiras e Serra da Estrela	0	-
169: Beira Interior Sul	0	-	0	-	17: Área Metropolitana de Lisboa	124	35%
16A: Cova da Beira	0	-	0	-	18: Alentejo	6	2%
16B: Oeste	11	4%	13	4%	181: Alentejo Litoral	6	2%
16C: Médio Tejo	0	-	1	0%	184: Baixo Alentejo	0	-
17: Lisboa	82	31%	106	33%	185: Lezíria do Tejo	0	-
171: Grande Lisboa	54	21%	72	23%	186: Alto Alentejo	0	-
172: Península de Setúbal	28	11%	34	11%	187: Alentejo Central	0	-
18: Alentejo	8	3%	8	3%	150: Algarve	101	28%
181: Alentejo Litoral	6	2%	5	2%	20: Região Autónoma dos Açores	30	8%
182: Alto Alentejo	0	-	0	-	30: Região Autónoma da Madeira	27	8%
183: Alentejo Central	0	-	1	0%			
184: Baixo Alentejo	0	-	0	-			
185: Lezíria do Tejo	2	1%	2	1%			
150: Algarve	64	24%	89	28%			
20: Região Autónoma dos Açores	38	14%	38	12%			
30: Região Autónoma da Madeira	27	10%	24	8%			

Table A.4: Gross Domestic Product of the companies from the maritime sector

Gross Domestic Product of the companies (€) - Portugal													
		2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Fisheries and Related activites	**0311.**	146701862	143497417	148466691	167187248	174618829	160694331	148455037	164993525	168426184	146013177	150044895
	0321.	6011693	5898436	6248220	6555658	1098861	750306	11458573	4810489	1170286	3329093	-944602
	08931.	2164122	2480897	2498932	2811437	2757816	3072582	2357578	2133713	2210134	2408496	2295112
	1020.	120070625	122997917	138310235	144861585	149932114	148153506	159766092	165840834	151625280	169270870	172614886
	46381.	87410032	91956031	95118074	98964624	87518946	82122870	84677847	87515560	91688359	80251140	89225981
	4723.	51337595	50940071	52825069	54358269	49419938	47271749	42191769	39007855	36173318	33683508	36703954
SB & SR	**301.**	58800699	76544272	79508022	89076524	110942622	61835067	23372176	21076312	20025467	27064291	28504493
	3315.	50411693	49097795	55348463	63242301	66279044	71341734	54000566	45014660	46651204	50756989	55032437
Maritime Transports	**5010.**	4179191	3556336	7061252	7178952	5239873	3477774	3845326	3761037	3954523	4143347	4341186.954
	5020.	62680171	64996529	56944543	68130878	70082804	49626946	34239655	36414861	30637026	38566439	57465000
	5222.	159171946	182943005	206215947	215676842	191023899	190935857	201066219	213980355	224105944	235644732	233798779
	7734.	348720	394715	538129	499524	795784	925210	1817223	1363008	1741711	1843902	2763501
	93292.	6416045	7464212	5285931	5715648	6055042	6505157	6533932	5586381	5024488	5768508	5045090

- estimated value

Table A.5: Application of the GDP implicit deflator change rate to the values of the correspondent year

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
(%) GDP Implicit deflator change rate	3.4	3.7	4.2	3.4	2.4	3.3	3.2	3	1.7	1.1	0.6	-0.3	-0.4	2.3	1
Value	0.034	0.037	0.042	0.034	0.024	0.033	0.032	0.03	0.017	0.011	0.006	-0.003	-0.004	0.023	0.01
Deflator application to the year	1	1.03700	1.08055	1.11729	1.14411	1.18186	1.21968	1.25627	1.27763	1.29168	1.29943	1.29554	1.29035	1.32003	1.33323

Table A.6: Gross Domestic Product of the companies from the maritime sector in 2000 constant prices

Gross Domestic Product of the companies (€) – Portugal in 2000 constant prices												
		2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Fisheries and Related activites	**0311.**	128223804	121416243	121725632	133081882	136674000	124406833	114245903	127355422	130527136	110613368	112542204
	0321.	5254481	4990793	5122823	5218336	860078	580874	8818125	3713127	906950	2521979	-708505
	08931.	1891537	2099140	2048837	2237918	2158540	2378741	1814311	1646973	1712812	1824574	1721465
	1020.	104946945	104071177	113398505	115310543	117351730	114697938	122950503	128009444	117506750	128232406	129470981
	46381.	76400167	77805971	77985895	78776334	68501000	63578137	65165166	67551627	71056760	60794848	66924560
	4723.	44871289	43101487	43310489	43269453	38680941	36596988	32469338	30109435	28033643	25517192	27530053
SB & SR	**301.**	51394367	64765751	65187445	70905357	86834690	47871663	17986425	16268412	15519362	20502755	21379991
	3315.	44062011	41542698	45379382	50341187	51876548	55231564	41556983	34745976	36153809	38451334	41277457
Maritime Transports	**5010.**	3652795	3009092	5789416	5714482	4101244	2692434	2959231	2903074	3064681	3138823	3256137
	5020.	54785194	54994958	46687984	54232518	54853747	38420342	26349664	28107951	23743121	29216293	43102018
	5222.	139123199	154792002	169073389	171679841	149514233	147819310	154733663	165167442	173677906	178514419	175362380
	7734.	304796	333977	441204	397624	622859	716282	1398472	1052080	1349793	1396862	2072783
	93292.	5607902	6315630	4333856	4549684	4739276	5036183	5028290	4312023	3893884	4369976	3784104

Table A.7: Gross Fixed Capital Formation of the companies from the maritime sector

Gross Fixed Capital Formation (€) - Portugal												
		2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Fisheries and Related activites	**0311.**	16674308	-8876290	23431015	13085488	16109032	4581965	7823165	34406237	25100982	35519226	32040387
	0321.	1263103	1323723	1542748	12452562	99703129	36807868	13674295	9317611	12818179	5228382	7228644
	08931.	483387	-65643	597545	582277	8907	539243	232111	1100548	-1142195	434697	-116609
	1020.	39400765	56965122	45530213	40109772	44709849	48005503	31472036	30380379	41145212	19921235	41942427
	46381.	23773627	20879364	19844385	18406716	16478124	11554866	14943290	16021290	11941716	10413788	8861772
	4723.	3299254	3105390	5445386	5849477	4658004	3931639	4374025	4463986	2433066	2245508	3636109
SB & SR	**301.**	35089304	9304638	29322184	16410117	15198117	8594712	4465984	3387141	3830566	2088202	-1141373
	3315.	3421365	8629019	6878806	8523113	5779487	3637775	2928396	2518658	553034	762612	4550882
Maritime Transports	**5010.**	27975161	-696147	11899637	3226433	-1062400	1156268	1002423	2849748	2147187	-3704348	6390778
	5020.	-26939002	8155777	37369650	41315726	25928852	-10094197	17634465	12279156	-9642246	8861578	-161536
	5222.	210594025	90350011	139296606	184102605	28755263	208703220	125326636	92100969	180370133	80718428	158858104
	7734.	111124	164124	849682	1497058	-340006	490413	2622121	529110	939128	69849	111443
	93292.	2285943	554540	118241	1344080	-223845	875014	67740	3103470	3480990	5460595	311536

- estimated value

Table A.8: Application of the GDCF implicit deflator change rate to the values of the correspondent year

	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
(%) GFCF Implicit deflator change rate	4.7	2.4	2.6	1.6	2.6	2.7	3	2.3	3.2	-1.7	0.5	0.4	-1.4	-0.8	-0.2
Value	0.047	0.024	0.026	0.016	0.026	0.027	0.03	0.023	0.032	-0.017	0.005	0.004	-0.014	-0.008	-0.002
Deflator application to the year	1.00000	1.02400	1.05062	1.06743	1.09519	1.12476	1.15850	1.18515	1.22307	1.20228	1.20829	1.21312	1.19614	1.18657	1.18420

Table A.9: Gross Domestic Product of the companies from the maritime sector in 2000 constant prices

Gross Fixed Capital Formation (€) - Portugal 2000 constant prices												
		2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Fisheries and Related activites	**0311.**	15225075	-7891738	20225304	11041250	13170979	3811069	6474579	28361716	20985007	29934377	27056645
	0321.	1153321	1176897	1331677	10507201	81518730	30615105	11317069	7680684	10716297	4406300	6104260
	08931.	441374	-58362	515792	491313	7282	448518	192099	907203	-954902	366348	-98471
	1020.	35976281	50646589	39301002	33843752	36555423	39928787	26046770	25043124	34398358	16788929	35418466
	46381.	21707362	18563439	17129378	15531186	13472754	9610810	12367310	13206654	9983553	8776381	7483362
	4723.	3012502	2760942	4700376	4935661	3808452	3270158	3620014	3679749	2034100	1892437	3070528
SB & SR	**301.**	32039547	8272574	25310473	13846499	12426202	7148689	3696121	2792085	3202443	1759865	-963837
	3315.	3124000	7671894	5937683	7191617	4725393	3025735	2423588	2076178	462349	642703	3843012
Maritime Transports	**5010.**	25543724	-618931	10271590	2722394	-868634	961731	829622	2349101	1795098	-3121897	5396721
	5020.	-24597622	7251144	32256926	34861310	21199807	-8395893	14594571	10121942	-8061143	7468232	-136410
	5222.	192290425	80328449	120238758	155341769	23510722	173589817	103722367	75920581	150793643	68026704	134148422
	7734.	101466	145919	733433	1263185	-277994	407903	2170110	436155	785133	58866	94109
	93292.	2087262	493031	102064	1134105	-183019	727797	138824	2558249	2910189	4602001	263078

Table A. 10: Gross Value Added of the companies (big groups) in 2000 constant prices

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fisheries	361588223	353484811	363592181	377894467	364226289	342239511	345463345	358386028	349744052	329504368	337480757
SB&SR	95456377	106308449	110566827	121246544	138711238	103103226	59543408	51014388	51673170	58954089	62657448
MT	203473886	219445658	226325849	236574148	213831360	194684551	190469320	201542571	205729386	216636373	227577422

Table A.11: Gross Fixed Capital Formation (big groups) in 2000 constant prices

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Fisheries	77515916	65197767	83203529	76350363	148533620	87684448	60017842	78879129	77162413	62164771	79034791
SB&SR	35163547	15944468	31248156	21038116	17151594	10174425	6119709	4868262	3664792	2402568	2879175
MT	195425255	87599612	163602770	195322763	43380882	167291356	121455493	91386029	148222920	77033907	139765919

Table A. 12: Searched words on INPI database that made part of the abstract of the patent applications

	Searched words - Patent applications										
	"Pesca"	"Aquacultura"	"Oceano"	"Mar"	"Marítimo"	"Energia ondas"	"Barco"	"Embarcação"	"Peixe"	"Naval"	"Navio"
No.	42	10	6	140	25	97	30	68	63	9	65

Table A.13: Region of reference's countries for the calculation of RCA of services from Maritime Transports

Year	2000				2004				2009				2014			
Services code	**206**	**207**	**208**	**209**	**206**	**207**	**208**	**209**	**206**	**207**	**208**	**209**	**206**	**207**	**208**	**209**
	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA
	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU
	ISL	POL	ISL	ISL	ISL	POL	ISL	ISL	ISL	POL	ISL	ISL	POL	GRC	GRC	GRC
	POL	GRC	POL	POL	POL	GRC	POL	POL	POL	GRC	POL	POL	GRC	IRL	IRL	IRL
	GRC	IRL	GRC	GRC	GRC	ITA	GRC	GRC	GRC	IRL	GRC	GRC	IRL	ITA	ITA	ITA
	IRL	ITA	IRL	IRL	ITA	LTU	ITA	ITA	IRL	ITA	IRL	IRL	ITA	DNK	LTU	DNK
	ITA	LTU	ITA	ITA	LTU	DNK	LTU	LTU	ITA	LTU	ITA	ITA	LTU	NOR	DNK	NOR
	LTU	NLD	LTU	LTU	DNK	NLD	DNK	DNK	LTU	DNK	LTU	LTU	DNK	SWE	NOR	SWE
	DNK	NOR	NLD	NLD	NLD	NOR	NLD	NLD	DNK	NLD	DNK	DNK	NLD		SWE	
	NLD	SWE	NOR	NOR	NOR	SWE	NOR	NOR	NLD	NOR	NLD	NLD	NOR			
	NOR		SWE	SWE	SWE		SWE	SWE	NOR	ESP	NOR	NOR	SWE			
	ESP								ESP	SWE	ESP	ESP				
	SWE								SWE		SWE	SWE				

List of abbreviation:
DNK - Denmark
NLD - Netherlands
NOR - Norway
FRA - France
DEU - Germany
ISL - Iceland
POL - Poland
ESP - Spain
SWE - Sweden
BEL - Belgium
GRC - Greece
IRL - Ireland
ITA – Italy
LTU - Lithuania